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ABSTRACT

This study evaluated the effectiveness of two Canadian computer-assisted career guidance services: the Computerized Heuristic Occupational and Career Exploration System (CHOICES) and the Student Guidance Information Service (S.G.I.S.). For three months, students were given access to both CHOICES and S.G.I.S. Students completed a questionnaire and a sample was also observed using both systems. The study reached 10 major conclusions: (1) Both systems contribute to student career maturity. (2) Neither system has a sound strategy for effective student use. (3) Many students require counselor assistance when using CHOICES. (4) There are important sex and grade differences in the use of both systems. (5) The introduction of computer-assisted guidance services demands a reappraisal of counselor roles. (6) The difference in cost between a batch and an on-line system cannot be analyzed without consideration of additional variables, including existing computer systems. (7) The use of both systems can require high levels of reading skill. (8) A prerequisite for effective use of both systems is student skill in decision-making. (9) Most students would prefer to have access to both systems rather than choose between them. (10) Career guidance specialists prefer the descriptions of careers available from S.G.I.S. but note a wide range of errors, omissions, and irrelevancies in both systems' printouts. (Author/JM)

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A COMPARATIVE ANALYSIS OF CHOICES AND S.G.I.S.:

Selected Aspects of On-Line and Batch Delivery Systems for Computer-Assisted Guidance Services

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EA 012 338

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Abstract

This study evaluated the relative effectiveness of selected aspects of CHOICES, an on-line computer-assisted career guidance service developed by the Department of Manpower and Immigration of the Federal Government of Canada. Additionally, the study compared selected aspects of CHOICES and the Student Guidance Information Service (S.G.I.S.), a batch computer-assisted career guidance service developed by the Ontario Ministry of Education.

The evaluation and comparison of the two computerized guidance systems focussed on:

1. An evaluation of the quality and accuracy of the CHOICES data base in providing occupational information and individual profiles to students;

2. A determination of the effectiveness and efficiency of the on-line terminal;

3. A comparision of CHOICES and S.G.I.S. in terms of:
   (a) data base accuracy and relevance;
   (b) delivery methods, namely on-line and batch processing;
   (c) associated costs: line charges and rental of terminals;
   (d) time involvement of students in the use of the systems.

Additionally, the use of an ethnographic evaluation model enabled the researchers to study several topics related to those in the preceding list. These latter contributions of this study include the development and application of a Criterial Scoring Key for Evaluating Print-out Material from Computerized Guidance Systems; a comprehensive review of the major computerized guidance systems available in North America; a consideration of "context" as a significant variable in analyses of "associated" costs; student reactions to on-line S.G.I.S.; counsellor reactions to both S.G.I.S. and CHOICES; and, summaries of two independent research projects that demonstrate the contributions both systems make to student career maturity.

Students in four Ontario secondary schools were given access for a three month period in the spring of 1978 to both CHOICES and S.G.I.S. From the population of students who used both systems, a selection of students were observed using each system. Also, all students who used CHOICES were requested to complete a survey questionnaire.

The major conclusions of the study are as follows:

1. Both CHOICES and S.G.I.S. contribute to student career maturity.

2. Neither system has been implemented according to a sound strategy for its effective use by students.

3. Many students appear to require counsellor assistance when using CHOICES.

4. There are important sex and grade differences in the use of both CHOICES and S.G.I.S.

5. The introduction of computer-assisted guidance services must be accompanied by a reappraisal of counsellor roles and responsibilities.

6. The move from a batch to an on-line system cannot be effectively "cost analysed" without consideration of the "context" of the decision.

7. Use of both CHOICES and S.G.I.S. can require high levels of skill in reading.

8. Student skill in decision making is a prerequisite for effective use of CHOICES and S.G.I.S.

9. Most students prefer to use both CHOICES and S.G.I.S. based on the nature of the information unique to each system.

10. Career guidance specialists prefer the general descriptions of careers available from S.G.I.S. but note there is a wide range of errors, omissions and irrelevancies in CHOICES and S.G.I.S. print-outs.

The study concludes with implications of significant findings and a series of recommendations. The recommendations are illustrative of the suggested direction the Ministry of Education might take in their decision making about on-line computerized guidance systems.

ABBREVIATIONS

CAAT	College of Applied Arts and Technology
C.C.D.O.	Canadian Classification and Dictionary of Occupational Titles
CHOICES	Computerized Heuristic Occupational and Career Exploration System
C.M.I.	Career Maturity Index
C.V.I.S.	Computerized Vocational Information System
E.C.E.S	Educational and Career Exploration System
I.L.S.	Interactive Learning System
I.S.V.D.	Information System for Vocational Decision
OWE	Occupational Work Experience Program
S.G.I.S.	Student Guidance Information Service
SIGI	System of Interactive Guidance and Information

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Preface

Perhaps no single event in the last twenty years has captured the imagination of educators to the extent that computer technology has. Teachers are beginning to question endless drill in fundamental operations when students can readily acquire skill in the use of reasonably priced calculators. Research is accumulating that demonstrates the effectiveness, for some students in specific subject areas, of computer-assisted instruction. Furthermore, school counsellors are challenged by the availability of computerized career guidance services.

With the assistance of a research grant from the Ontario Ministry of Education, the researchers conducted a comparative analysis of selected aspects of Ontario's Student Guidance Information Service (S.G.I.S.) and the Federal Government's Computerized Heuristic Occupational Information and Career Exploration System (CHOICES). Of particular interest to the research team were a comparison of on-line and batch processing; the relative effectiveness of the respective implementation procedures; student use of and preferences for selected features of each system; a comparison of comprehensiveness, relevance, accuracy and style of each data base; contributions of each system to student career maturity; and, the relative costs associated with the introduction, maintenance and further development of each system.

This research could not have been completed without assistance from many people. In the first instance, the Ministry of Education in cooperation with the Federal Government, arranged for five CHOICES terminals to be located in Ontario. In addition, the Ministry of Education funded this contractual research study. Throughout the duration of the study, the research team received unflinching cooperation from personnel at the Special Projects Branch at Mowat Block.

The following guidance personnel and students from their schools enthusiastically supported the research: Don Powell, Grimsby and District Secondary School; Bruce Inch, West Toronto Secondary School; Jean Runnells, Sir John A. MacDonald Secondary School; Flora Hunter, Georges Vanier Secondary School; and Orv Lyttle, Lockerby and District Secondary School. This study placed considerable demands on these guidance counsellors, their guidance departments and their students. Nevertheless, each individual responded with maximum participation.

Three guidance specialists, namely Bruce Knicley, George Brooks and Lee Howden, all from the Lincoln County Board of Education, worked with the research team on an assignment that resulted in a comparative analysis of the S.G.I.S. and CHOICES data bases. Bruce Knicley also warrants consideration for his contribution to the interviewing of several of the guidance personnel involved in the study.

Joan Doyle, Joan Graziani, Valerie Lattimer, and Kathy Larmour typed this report and assisted at critical phases of the study with a wide range of clerical and secretarial contributions.

The researchers owe a debt of gratitude to Phil Jarvis, Catherine Casserley, Stuart Conger and their associates from the Office of Employment and Immigration. The professional manner with which these people discharged their responsibility complemented the objectivity and support of their counterparts in the Ontario Ministry of Education.

George E. Burns, Project Director of the Timmins Field Development Office of the Ontario Institute for Studies in Education, was consulted for information on labour market statistics, vocational development of secondary school students, and testing for career maturity. Professor Phil Manuel of the Faculty of Education, University of Toronto, was consulted about the interfacing of traditional and computer-assisted guidance services as well as the nature of employability skills.

Donna Starr, a graduate student at the University of Calgary, completed a master's thesis on CHOICES. The researchers appreciate Donna's willingness to contribute excerpts from her study.

Special acknowledgment is given to Michael Robinson, Temporary Research Office for Northeastern Field Development Centre of the

Ontario Institute for Studies in Education. Michael assisted with the development of instruments; collection, tabulation and analysis of data; a presentation of results, from the first phase of the study, to officials at Mowat Block; and the establishment and maintenance of the communications network.

Results from this study will have several important uses:

(i) the analysis of computer-based career education resulted in an explication of positive and negative features associated with computerized guidance systems;

(ii) results from Student Questionnaires and Structured Interviews will be important in deliberations about further development, implementation and evaluation of computerized guidance;

(iii) the Criterial Scoring Key for evaluation of computerized guidance print-outs is an instrument with sufficient rational validity to be of use to other researchers in studying information from computer print-outs;

(iv) the statistical analysis of judges' comments about the print-outs resulted in empirically sound conclusions about data bases from each system;

(v) the information on costing of computerized guidance systems is essential to the debate, "batch versus on-line" systems;

(vi) the reporting on two empirical studies of S.G.I.S. and CHOICES respectively gives empirical evidence in support of the contributions that these systems make to the career maturity of students;

(vii) conclusions and recommendations from this study will contribute critical information required by officials at the Ministry of Education for their long-range planning in the career guidance area.

1 Background and Design of the Study

Background

In response to sudden changes in the world of work, the Ministry of Education for the Province of Ontario introduced the Student Guidance Information Service (S.G.I.S.) to secondary schools. Whereas this service was available since the early 1970's to all secondary schools, for a variety of reasons some guidance departments did not wish to purchase the computer-assisted guidance service. Nevertheless, faced with an exponential increase in educational and career-related information, counsellors were in general agreement that S.G.I.S. offered an essential guidance service.

In September, 1977, all secondary schools were given free access to S.G.I.S. The already heavy use of this excellent system suddenly increased with the heavy demand for education- and career-related information. Meanwhile, personnel within the Special Projects Branch of the Ministry of Education continued to explore other educational interventions that could expedite the career maturity of students. To this end, the Senior Guidance Guideline and the Intermediate guidance Guideline were released. In addition, officials from the Ministry of Education have watched very carefully the development of technology for computer-assisted career guidance services.

Having already explored the use of S.G.I.S. "on-line" and a variety of approaches for streamlining the "batch" processing of student requests for information from S.G.I.S., Ministry officials have observed with interest the emergence of more advanced computer systems for career education. Through cooperative interaction with officials at the Department of Employment and Immigration of the Federal Government officials at the Ministry of Education arranged to have terminals for CHOICES placed in four secondary schools and at the Special Projects Branch. Several of the anticipated advantages of CHOICES - the on-line computer-assisted guidance service - were the immediacy of feedback; the routes for more extensive exploration of personal aptitudes and interests; and, the wider range of career-related information available on a limited range of careers.

However, in the absence of studies that demonstrated the effectiveness of CHOICES with a secondary school student population, and with the recent development of the system, Ministry officials contacted the principal investigators with a request that CHOICES be evaluated. The research contract described an objective study that would:

1. evaluate the quality and accuracy of the CHOICES data base in providing occupational information, training, and individual profiles to students;

2. determine the effectiveness and efficiency of the on-line terminal;

3. compare CHOICES and S.G.I.S. in terms of the data-base accuracy and relevance; delivery methods, namely on-line and batch processing; associated costs including line charges and rental of terminals; and, time involvement of students.

Since the researchers were engaged after a pilot project with CHOICES had begun, an ethnographic evaluation model was introduced, which enabled the research team to make informed judgments about the preceding foci of the contract. One additional benefit of the model for evaluation is that it broadens the scope of the research to include a variety of additional yet related and relevant research goals.

In summary, the project was initiated by the Ministry of Education in an effort to supplement knowledge about computer-assisted guidance services. This research report documents findings, explains implications, and suggests recommendations that respond to this intention.

Design

This research was designed to evaluate and compare selected aspects of CHOICES and S.G.I.S. Since the research assignment, described in the preceding section of this report, began after schools already had access to CHOICES and S.G.I.S., the research team could not use random selection and assignment of students. For this reason, coupled with the relative breadth of the questions for which answers were sought, an ethnographic evaluation model was used.

The inherent advantage of this model is that it is based on the assumption that "pre-research" observation of subjects can result in the emergence of important research questions. These research questions are then used to "flesh out" the initial set of considerations upon which the research assignment is based. Furthermore, while the researchers were not limited only to this model, the ethnographic model is the essential basis for this research design.

The research design includes the following phases:

1. An exhaustive review of the research literature on computerized guidance. The standard approach to research reviews consists of an analysis of all research related to a particular set of research questions. Such analyses are used to develop a rationale for further study on questions already carefully formulated by the researcher. In the present study, the review of the literature was used as a means by which the initial set of research questions could be expanded to include additional research questions generated by the process.

The review of the literature focussed on computer-assisted guidance services extant in North America; contributions of computer-assisted guidance services to student career maturity; and, all aspects of S.G.I.S. and CHOICES, batch and on-line services respectively.

2. The next step in the design included visits to every pilot school. During these visits, students were observed while they were making use of CHOICES and S.G.I.S. Also, guidance counsellors responsible for the CHOICES - S.G.I.S. project were interviewed. For these interviews, the research team followed a structured interview format outlined in chapter 3 (see Table 1).

3. A small sample of available students from a secondary school not in the pilot study were then taken to the Mowat Block. These students were divided into two groups of five. One group used on an individual basis the CHOICES terminal and the other group used the S.G.I.S. on-line terminal. After each student in the group used the one system, the student groups switched systems. Student reactions to the two systems were then observed. In addition, students were interviewed by the research team. This procedure enabled the researchers to collect student reactions to the two systems when the question of on-line and batch processing was selectively eliminated.

4. All student users of CHOICES were requested, during the last week of the pilot project, to complete a questionnaire. This questionnaire, included in the report as Appendix I, contains two sections. Section A focussed only on student reactions to CHOICES. Section B, completed by those students who used both CHOICES and S.G.I.S., focussed on student reactions to S.G.I.S.

5. Phase four of the design included the selection of four specialists in guidance who independently evaluated a random selection of computer print-outs on 34 careers available from both CHOICES and S.G.I.S. A statistical procedure was applied to the selection of careers such that those careers (from 180,000 requests) that were most frequently requested by students had a higher probability of being selected.

A Criterial Scoring Key was developed (Table 1, page 14). and applied by the career guidance specialists to these print-outs. Using a rational analysis of the career guidance specialists' responses, the research team explicated a consensus view about the relative strengths and weaknesses of the two data bases.

6. A Sign Test (Nonparametric) was then used to statistically analyse the coded data from the career guidance specialists' responses to the print-outs. The research team then selected the "conservative" approach to the handling of "ties." Based on results from this conservative procedure for handling ties, estimates of data-base sufficiency, relevance, accuracy, and so forth can be made for the two systems.

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7. A discursive account of "costing" computerized guidance systems was then begun. Given the rapid changes in computer technology and the time-line for this study, the research team judiciously completed this aspect of the research project just prior to the writing of the final report.

8. Two empirical research studies were included in this report. These studies are the only empirical research studies completed to date that document increases in student career maturity attributable to the two computer-assisted guidance systems.

2 Review of the Literature

Computer-Based Career Education

The need to prepare students for the world of work has received considerable emphasis in modern school curricula. The articulation of this need stretches back to such early proponents of career education as the Lynds (1937) who stated "(the career) is the most nearly dominant single influence in a man's (woman's) life." More recently, speaking from a psychological perspective, Erikson (1959) stressed that "in general it is primarily the inability to settle on an occupational identity which disturbs young people."

Since, according to Caplan (1963), pupils typically possess invalid and inaccurate data about the world of work, there is a critical need to furnish the required information. Katz (1963) underscored this conclusion by writing "only when the guidance counselor has supplied information can he help the student to weigh and think rationally about the options" (p. 58). Cooley (1969) puts it a little more succinctly: "Good decisions require good information".

Nevertheless, Flanagan (1969) and others have shown that current programs for providing career guidance to secondary schools are not nearly as effective as the demands of the present complex society require. The apparent inability on the part of career guidance personnel to fully respond to the career needs of youth results, to a large extent, from the sudden changes in the world of work. Venn (1964) was one of the first researchers to describe adequately these changes:

> It is not simply a case of new sets of social and economic relationships replacing older ones, but of new ones themselves being replaced at a faster and faster rate, with only those adapted to change surviving ... what is new is the change in the rate of change. (p.3)

For the secondary school guidance counsellor, summoning a defensible response to the sudden changes in the world of work has

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become a difficult task. Overton (1975) describes the counsellor's role this way: "to help the student discover where his or her interests and aptitudes lie so that he, or she, may go forth ... and tackle the Goliath of his or her future education and career." Overton continues to reflect on the momentous task as he stresses the consequences of so many students, so many post-secondary education and future career possibilities. For the guidance counsellor in particular, the job has become "difficult beyond belief, and, in some cases, next to impossible."

Within this context of change, both in the world of work and in the counsellor's role, computer technology has been introduced to schools. Since the early 1960's, there has been considerable reponse to the possibility that computer applications can contribute to student career maturity and counsellor functioning. Cooley (1964) stressed the tapping of technology to reduce counsellor time in the area of administrative "paper-shuffling" and search-retrieval activities. Bohn and Super (1969) and Minor (1970) suggest that the computer be used to free the counsellor from routine information dissemination.

In 1972, Harris reviewed computer systems extant in the United States. She summarized their functions by showing the diversity of systems that: automate the observed client-counsellor interaction; maximize the facilitation of the end goals of the counselling process; and disseminate vocational, educational and personal-social information. Impelliteri (1969) mentioned the advantages of flexibility in storage and updating of occupational information.

Herr and Cramer (1972, p. 272) have listed nineteen projects which claim to use computer technology in vocational guidance. They summarized the functions of these projects by stating that some are merely information vehicles; others are more ambitious, attempting something close to a counselling approach.

While Roberts (1968) mentioned that computers add a qualitative dimension to communication in guidance, McGrail (1967) warned of pitfalls occasioned by counsellor dependency on computer technology. Tiedeman

(1972) compared the computer to a "prosthetic device" for career decision-making. Katz (1969) highlighted the use of the computer as a tool by which students can get acquainted with personal value systems.

The diversity of uses to which the computer has been put for the facilitation of career development is apparent in the number and types of computer-based guidance systems. A Report of the National Vocational Guidance Association's Commission on Computer-Assisted Guidance Systems (1971) identified two major types of computer-based guidance systems: direct and indirect inquiry. Three sub-types of direct inquiry systems include:

(a) Direct-Inquiry with Monitoring

Personal data about the inquirer, usually including test information, interest profiles, courses and grades, are stored. These data are then related to the inquirer's exploration. Several of these systems are: the Palo Alto Unified School District's Computer-Based Course Selection and Counselling System; International Business Machine Corporation's Educational and Career Exploration System (E.C.E.S.); and the Willowbrook High School's Computerized Vocational Information System (C.V.I.S.). Each of these systems is in use by students and counsellors.

(b) Direct-Inquiry with System and Personal Monitoring

This type of system provides for direct, immediate feedback from the computer. However, this system is limited, as is the indirect inquiry system, to data storage, search and retrieval. An example of this type of system is the Interactive Learning System (I.L.S.). This commercially operated system based in Boston, Massachussetts offers its programs, data files, and computer service to schools in America.

(c) Direct-Inquiry With System and Personal Monitoring

This system, in addition to the Direct-Inquiry with monitoring, allows the inquirer to enter commands in his/her own language from the terminal device which causes the computer to execute functions not originally designed or programmed. Harvard's Information System for Vocational Decisions (I.S.V.D.) was a system with both pre-designed and personal monitoring. While considerable interest has been paid the researchers working on this system, it subsequently lost its funding from the United States Office of Education.

Several common characteristics of Direct Inquiry Systems (See Harris, 1972) are:

(1) The user receives immediate, interactive responses to his/her inquiry.

(2) The user has a high degree of control over the computer program.

(3) The user is aware of the effect of his/her choices and options.

(4) The system provides a high degree of personalization because of the extensive use of personal data.

(5) The program allows the user multiple opportunities to remake choices, test alternative paths, recycle, and branch from one portion of the system to another.

The Indirect-Inquiry Systems include those systems in which a student completes a questionnaire or computer card to retrieve information about educational, vocational or financial concerns. These programs have been designed to take advantage of computer capability for storage, sorting, and retrieval of data. As far back as 1969, Rosser had identified nineteen such commercial systems in operation. Since these systems are typically less expensive to devise and considerably less complex than the Direct-Inquiry Systems, many commercial conglomerates have shared the market.

Indirect-Inquiry Systems generally perform the following:

(1) The user receives a response after a period of one to two weeks.

(2) The user makes use of the system for occupational, educational and financial information.

(3) The systems do not compare student knowledge of self with the requested information.

(4) The information, depending on the company or institution marketing the system, may be incomplete relative to the stated criteria of the inquirer.

The Ontario Ministry of Education's Student Guidance Information Service (S.G.I.S.) is an operational example of an Indirect-Inquiry System.

Of particular importance to the present research project, namely the comparison and evaluation of selected features of the Student Guidance Information Service (S.G.I.S.) and CHOICES, is a proposal to classify computerized guidance systems. One such classification suggests that computerized guidance systems be identified in terms of generations, with the first generation being "batch" information storage and retrieval systems (S.G.I.S.); the second generation being on-line information storage and retrieval systems (of which Computerized Vocational Information System, Oregon Career Information System, Educational and Career Exploration System and Guidance Information System are examples); and the third generation being on-line information systems that deliver significant guidance content beyond career information. System of Interactive Guidance and Information (S.I.G.I.), DISCOVER and CHOICES are examples of this third generation.

Evaluation Studies of Computer-Assisted Career Information Services

It is interesting to note a relatively recent comment of English (1974) regarding computer-assisted guidance systems:

> Every major computerized guidance service has its own rationale. These rationales are somewhat contradictory and share consensus only on the most general levels, such as that there is

> a great need for such systems and that students should benefit directly from them (p. 52).

Price (1971) compared the effectiveness of a Computer-Based System to a regular counsellor for course exploration and selection. His findings show that the computer matched the counsellor relative to student understanding of courses, student reactions to course selection and number of student errors.

Melhus (1971) found that computer-assisted vocational counselling was best for facilitation of vocational choices of high-ability, high-readiness students. For low-ability, low-readiness students, the traditional vocational counselling person was preferable.

Pilato and Meyers (1973) have written that students exploring occupations while being given self-knowledge feedback from the computer made more accurate reports of self-knowledge than did the control group. This finding is interesting in light of a statement of Herr and Cramer (1972):

> Both educational and occupational information have meaning only insofar as such data are evaluated within the framework of what an individual knows about himself. Self-information is crucial to an individual's seeing the relevance of the educational and/or occupational data which he receives (p. 278).

Recently, Maola (1974), demonstrated that students enrolled in an Occupational Work Experience program (O.W.E.) at a high school learned career information more effectively from a computer-based information system than from a counsellor-based system. Pilato (1968) found that students exposed to the E.C.E.S. system improved in the appropriateness of their vocational preferences and in the accuracy of their self-knowledge. Bohn and Super (1969), however, found that after three months of E.C.E.S. experience, the vocational maturity scores of experimental students were not raised significantly. However, the amount of decision-making information was raised significantly.

Harris (1972), in the C.V.I.S. and Palo Alto Project, reports that some counselling functions (registration and vocational planning) may be effectively done by computers. Also, use of C.V.I.S. by sophomores significantly increased the accuracy and range of information about specific occupations and overall vocational maturity. It did not increase the number of occupations students viewed as personal options.

Loughary, Friesen and Hurst (1966) suggest that counsellor-generated plans appear to last longer than computer-generated plans. Minor (1970) comments that the flexibility and usefulness of the computerized system is largely dependent on the student's immediate needs and his or her judged level of vocational maturity.

According to Rayman et al. (1978), evaluations of first and second generation systems suggest that certain positive effects are achieved. Students accept computer-based guidance systems with enthusiasm and do not feel dehumanized by them. Even when provided with alternatives, students frequently return to a computer system, preferring it to books, audio-visual aids, and other traditional sources of assistance. Rayman et al. conclude that despite problems in interpreting evaluative data from studies of computer-based guidance systems, students are reporting:

(1) an increased awareness of the nature of the world of work;

(2) an increased awareness of the relationship of interests, aptitudes, and values to occupational choice;

(3) the consideration of an expanded number of vocational options;

(4) a greater ability to make vocational and educational decisions;

(5) an increase in occupational knowledge; and

(6) increased occupational exploratory behaviour.

The fact remains, however, that most research on computer-based guidance systems has been conducted by professional interest groups who already have a vested interest in a particular system. Moreover, many of these studies lack the experimental rigor required of empirical research studies.

3 The Structured Interview with Counsellors

The Questionnaire

As mentioned previously in this research report, the research team visited every school in the study and maintained a close working contact with key personnel involved in the CHOICES/S.G.I.S. study. One data collection procedure used in this study was a Structured Questionnaire.

The Structured Questionnaire (Table 1) outlines the series of questions that the principal investigators used when interviewing each of the counsellors responsible for the CHOICES/S.G.I.S. project. Qualitative data from these interviews were then subjected to rational analyses by the research team. These data were grouped for all the schools in the study; the responses represented here reflect those reactions about which the counsellors are in general agreement.

It is important that the reader recognize the uniqueness of each of the four secondary schools participating in this research. Each of the guidance departments made its own arrangements for incorporating the two computerized guidance systems into its comprehensive guidance program. These guidance departments were staffed differently; had both common and unique student needs to which they purported to respond; and managed their participation in this research according to individual styles of staff allocation.

Several significant reactions to the use of both CHOICES and S.G.I.S. that are common to more than one school are discussed in the following summary. These summary comments are made in an attempt to present a concise but a manageable synthesis of the unwieldy data collected during the structured interviews.

Summary of Responses

(a) Counsellor Commitment to the Use of the Systems

Within the diversity of the four participant guidance departments, there was considerable difference in counsellor reaction to the systems.

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TABLE 1

Structured Interview Questionnaire

(For Use During Personal Visits to Secondary Schools
in the CHOICES/S.G.I.S. Study)

1. How did you first hear about this study?
2. Why did your school (you) become involved in the study?
3. Who in your school is responsible for the CHOICES/S.G.I.S. Study?
4. What training did you receive in the use of each of the computer Guidance systems?
5. What are your reactions to the training you received on each of these systems?
6. What on-going communication have you had with the CHOICES system's team?
7. What on-going training have you had with the S.G.I.S. system's team?
8. What reactions do you have to the support you have or have not received from personnel on the CHOICES and S.G.IS.S systems' team?
9. What has been done in your school to encourage use of CHOICES?
10. What has been done in your school to encourage use of S.G.I.S.?
11. What was your initial response to the implementation of each system in your school?
12. What problems for your staff and students did you anticipate each system would generate?
13. Which of these problems materialized?
14. What other problems have you faced?
15. What information have you received about the present research study?
16. Has anyone attempted to evaluate the effectiveness of CHOICES or S.G.I.S. with your students?
17. What has been the incidence of system breakdown for the CHOICES system?

18. What has been the incidence of delay in feedback from S.G.I.S.?

19. What changes have occurred in your total guidance program because of the availability of the systems in your school?

20 How would you describe the general reactions of the following groups to each system?

Students (senior):

Students (junior):

Teachers:

Guidance Staff:

School Administrators:

Parents:

Community:

Since only one counsellor in each department received training in Ottawa for the CHOICES system, there appeared to be, in some schools, unrealistic expectations for this individual, in that he/she was identified as the person responsible for success of the program. In addition there were among the guidance staff members different levels of interest in the computerized guidance systems. These interest levels ranged from disinterest to enthusiastic support.

In one school, counsellor commitment to CHOICES resulted in a decision not to implement S.G.I.S. That is, students were not given an opportunity to access the information base available through the S.G.I.S. system. The guidance counsellor felt that the demands of implementation were too great to warrant involvement with both systems.

On a school-wide basis, with the one exception (where S.G.I.S. was not made available), all guidance departments appeared to market the computerized guidance systems vigorously and enthusiastically. From school to school, however, this marketing process was conducted by different numbers of guidance personnel.

(b) Change in Counsellor Role

The counsellors interviewed were in general agreement that the implementation of the systems changed their roles. Several reacted to the excessive time required to introduce the systems and effectively monitor their use. In one school, the statement was made that these computerized guidance systems add a 10% increase to the work load but result in a 100% increase in efficiency. Still another department head stated that the systems require an increase in priority given career education and relative decreases in other areas of responsibility.

Increases in counsellor time associated with responsibility for the new services were described in several ways. Many felt they personally had to oversee all student interactions with CHOICES. Others saw the need to train students in the use of CHOICES and S.G.I.S. as very time consuming. The required follow-up of student users was an additional consideration. Finally, the need to "guard" the safety of the computer console and the scheduling of student users of CHOICES involved considerable time spent in administration.

There were inconsistent responses to changes in role associated with the implementation of computer-assisted guidance. Several counsellors gave the new service top priority based on a belief in its value to students. Several others reluctantly shifted priorities at first but during the research period developed increased commitment to CHOICES and S.G.I.S.

(c) The Computer Is Down!

In every school, counsellors and students reacted negatively to the number of times the CHOICES system was inoperable. Even though counsellors reacted positively to attempts made by Ottawa personnel to explain the "shut-downs," counsellors and students were dissatisfied.

Similar reactions were not voiced about any delays that may have occurred with S.G.I.S. print-out material. Counsellors received the S.G.I.S. material within the seven to ten day waiting period and reported very few delays.

Of particular concern to some counsellors were computer problems that occurred while students were in the middle of their interactive sequence. In one school, students who faced such system breakdown were counselled immediately after each system failure.

The one positive feature of system breakdown was registered by a guidance head. This person, having noted that some students appear to attribute unrealistically high credibility to the computer system, are "balanced out in their feelings by the frequent computer shutdowns." According to this counsellor, "it's as if the students need the system failure to off-set unrealistic expectations attributed to its use."

(d) Contact with the Ministry of Education

Most counsellors interviewed regretted that they had only limited interaction with the Provincial Ministry of Education. This personal contact was not solicited by these counsellors, yet counsellors wanted it. They stated that they needed suggestions for implementing S.G.I.S. (a system made available to all secondary schools in September 1977). Several counsellors would have used the contact with the Ministry of Education officials to mention concerns they had about selected pieces of information on S.G.I.S.

Perhaps the negative response to lack of Ministry of Education involvement in the school's participation in the study and the school's subsequent use of S.G.I.S. came from the fact that the CHOICES team kept excellent contact with the schools. Through the personal training sessions received in Ottawa and frequent print or telephone interactions, counsellors had frequent communication with CHOICES personnel. These counsellors stressed their expectation that the Ministry of Education would also increase its personal support of the study.

When asked why they felt the Ministry had taken an arm's-

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length attitude to their involvement in the study, several counsellors mentioned the possibility of experimenter bias. They thought the Ministry officials were trying not to destroy the objectivity of the study.

(e) Training in the Use of CHOICES

The one-week training session in Ottawa was viewed as very short and insufficient. Counsellors did not realize at the conclusion of their training session that they were unprepared to fully implement CHOICES. Their feelings of inadequacy arose once they returned to their school settings and had complete responsibility for implementation of CHOICES.

Further training was requested in several aspects of the system. Counsellors identified the need to study means by which the computerized guidance system could interface with other guidance program priorities. Several wanted more training in counselling students in the most efficacious use of the system. Still others would have liked more opportunity to use all routes on CHOICES during their training in Ottawa.

(f) Reactions to Student Use of CHOICES

Every counsellor offered constructive criticism about student use of CHOICES. These reactions were recorded during the initial phase of implementation of the system and may have changed during the period of continued use of the system.

(i) Concepts and vocabulary in the print-outs were too demanding for weaker students.

(ii) Students' knowledge of self is often so poor that they cannot make reasonable use of the self-determined aptitude levels.

(iii) CHOICES demands logical thinking. Many students need additional training before they can adequately engage the computerized guidance system.

(iv) CHOICES assumes student skill in decision making. Many students are intuitive decision makers and are frustrated by an awareness of a need to decide rationally.

(v) CHOICES' limited range of careers needs to be enlarged or students will be given only a narrow view of the vocational opportunities in the world of work.

4 Selected Student Reactions to "On-Line" S.G.I.S.

The research team fully recognize the impossibility of fair comparison of two computerized-guidance systems that are founded on two distinct periods in the recent history of computer technology. Each system has its own rationale, covers a specific range of career-related information and employs a unique inquiry process. Thus, in the interest of fair comparison, a small sample of students from a secondary school not in the actual study were given access at Mowat Block to CHOICES and S.G.I.S. "on-line." These students from grades 9-13 were divided into two groups, one half using CHOICES and then S.G.I.S. and the other half using S.G.I.S. and then CHOICES.

Time constraints were such that students could not spend more than thirty minutes per system. Nevertheless several interesting facts emerged from time-limited interviews with each student immediately after use of the two systems.

(a) All students preferred the S.G.I.S. Visual Display Screen to the interactive computer print-outs. The Visual Display Screen was cited as "easier to read," "more convenient" and "less straining on the eyes."

(b) When given the opportunity to have S.G.I.S. on-line, approximately one half of the students preferred it to CHOICES. There were no apparent grade or sex differences.

(c) Twenty percent of the students who preferred S.G.I.S. "on-line" to CHOICES stated they would probably never use S.G.I.S. "batch" since they did not wish to wait one week for print-outs. Of this group, a few reacted to the "inconvenience" of the computer cards.

(d) All students in this limited sample were highly motivated by the on-line systems. Each affirmed that he or she would use the on-line system "many times" during the school year.

Obviously, data from this small, non-representative sample cannot be used as conclusive evidence favouring one system or the other. The reactions of these students from across the grades in a large secondary school do warrant further study. The clear advantages, for this group, of the S.G.I.S. on-line and the Visual Display Screen stand as potentially important points in any sort of decision to change the delivery mode of S.G.I.S.

5 The Student Questionnaire

The questionnaire constructed to collect information from students who used both S.G.I.S. and CHOICES is presented in Appendix I.. Illustrated in Table 2 below are the number of students using CHOICES and S.G.I.S. who completed "The Student Questionnaire."

TABLE 2

Percentage of Students by Grade Who Used Both CHOICES and S.G.I.S.

GRADE	*CHOICES (# of Students)*	*S.G.I.S. (# of Students)*	*PERCENTAGE OF STUDENTS USING CHOICES & S.G.I.S.*
9	47	8	17.0
10	45	4	8.9
11	60	17	28.3
12	122	65	53.3
13	43	20	46.5

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Observation of Table 2 demonstrates that very few students in grades nine, ten and eleven appear to have used both CHOICES and S.G.I.S. At the grade twelve and thirteen levels, however, approximately one student out of every two students using CHOICES also used S.G.I.S. These data, however, require further analysis since there are definite reasons for the seemingly low numbers of users of S.G.I.S. for grades nine, ten and eleven.

In administering the questionnaire to students in all schools, the researchers wished to collect reactions to the two computerized guidance systems. The more realistic approach to the collection of comparative data was to get student reactions from users of CHOICES, the system under study, and comparative data on CHOICES and S.G.I.S. from users of both systems. For this reason, no student users of only S.G.I.S. were sampled, and as a result the sample is small of S.G.I.S. users responding to the questionnaire. Table 2 , then, shows only the number of students who used CHOICES and the number of students who used both CHOICES and S.G.I.S. Table 2 does not account for the many students in each grade who used only S.G.I.S. Data from this latter group were not required for the comparative analysis of CHOICES and S.G.I.S.

Student Usage of CHOICES and of Both CHOICES and S.G.I.S.

The data presented in Table 3 show the mean usage and percentage usage by sex of CHOICES and both CHOICES and S.G.I.S. The anticipated usage of CHOICES is approximately three times per year. During the period of the study, however, 61.7% of the males and 71.9% of the females using CHOICES used it only once.

Whereas the anticipated yearly usage of S.G.I.S. is 2.6 times per student, this information must be interpreted. Student users of CHOICES report that, on average, they would use S.G.I.S. 2.6 times per year. That is, students would use S.G.I.S. 2.6 times per year in addition to use of CHOICES. Observation of Table 3 shows that

49.1% of the students using S.G.I.S. had already used it twice or more during the school year.

TABLE 3

Percentages of Students by Sex Using Only CHOICES and Both CHOICES and S.G.I.S.; Anticipated Yearly Use of Each System, Based on Judgments of Those Students Who Have Used Both Systems.

	CHOICES			S.G.I.S.		
Number of Times	M	F	$\bar{X}$	M	F	$\bar{X}$
1	61.7	71.9	67.7	45.1	55.7	50.9
2	21.1	18.9	19.8	39.2	32.8	35.7
3	17.2	9.2	12.5	15.7	11.5	13.4
Anticipated Yearly Use	3.0			2.6		

These data appear to suggest that students who have used both systems would make use of "computerized guidance" approximately six times per year, making equal use of both the "batch" S.G.I.S. service and the CHOICES service.

Student Orientation to CHOICES

The CHOICES support personnel in Ottawa recommend that students complete a worksheet prior to use of this system. The worksheet is designed as a counselling tool by which students can learn more about CHOICES and make decisions, prior to their interaction with the system, about the best use of the system. In response to the question "Did you complete a worksheet before you used CHOICES?", 123 of the 128 respondents sais "Yes." Almost every student user of CHOICES completed a worksheet.

The students were then asked to reflect on their response to the worksheet. A total of 91 of these students believed the worksheet saved them time at the CHOICES terminal. Only 7 students found the worksheet confusing and 9 stated it did not assist with the use of the CHOICES system.

Time spent preparing to use the CHOICES terminal varied among students. Further analysis of this variation did not suggest that a student's grade level was associated with preparation time. A total of 96 students spent thirty minutes or less preparing for use of CHOICES. Only 28 students spent as much as sixty minutes in the same preparatory activity.

How "Immediate" Is Choices' Feedback?

The average student requesting to use CHOICES waited about one week before actually using the system. In Figure 1 below, the data on the waiting period for use of CHOICES appear.

FIGURE 1

Student Response to the Question:
"How long did you wait between the time you first asked about CHOICES and you actually sat at the CHOICES terminal?"

	# of students
I used CHOICES the same day	8
I waited several days	49
I waited about a week	30
I waited more than a week	40

The significance of this question should be emphasized. One of the major advantages of the CHOICES on-line, or direct inquiry system is its potential for giving immediate feedback to students. Students at the terminal ask their questions (type them in) and receive a print-out immediately. With the S.G.I.S. system, a batch or indirect delivery system, students typically wait about one week for a computer response to their questions. The point is, however, that students are waiting, on average, for one week or more to use the CHOICES system. The obvious advantage of immediate feedback to student queries must be studied very carefully. Observation of Figure 1 shows that most students do not, in fact, get immediate responses to questions since they wait to use CHOICES. The immediacy comes only when they have received access to the terminal.

The reasons for delay between the times a student wanted to use the terminal and actually had access to it were cited as "Too many people wanted to use CHOICES" (70 students); "I missed my

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appointment" (71 students); and "The CHOICES terminal was out of order" (14 students). Students wanted to use CHOICES but were not able to because the one-person interaction possible with the on-line system necessitates delays.

Why Did Students Use CHOICES?

In response to the question "Why did you first use CHOICES?", students gave a variety of reasons. Of the 130 responses to the question, 52 used it because they wanted assistance with their career searching, 44 respondents were "curious" about the system, 21 said it was recommended by a counsellor or teacher and 11 reported they had to use it (required by the teacher).

Of particular interest in these findings is the high number of students who were inquisitive about what the system was and what it would do. Since the students who used CHOICES reported they would anticipate a yearly usage of 3.0 times, many of the curious students did become seriously involved with the system.

Use of Print-outs from CHOICES and S.G.I.S.

Educators in general and counsellors in particular have attempted to find out who particpates in students' career decision making. Do students talk only to peers? Are parents important in this process? Where do teachers and counsellors fit in? To study this question, the researchers asked student users of CHOICES and both CHOICES and S.G.I.S. what they did with their print-outs. The data collected appear in Table 4 below.

TABLE 4

Student Use of Print-outs from CHOICES and S.G.I.S. Based on Percentage Use by Sex

	Male %		Female %	
	S.G.I.S.	CHOICES	S.G.I.S.	CHOICES
Shared with a friend	21.2	19.7	23.3	24.5
Shared it with parent/ guardian	46.2	38.6	38.3	44.0
Shared it with counsellor	17.3	3.9	8.3	4.9
Shared it with teacher	0	1.6	6.7	0.5
Shared it with myself	40.4	50.4	53.3	46.2
Discarded it	0	3.1	1.7	2.1

Observation of Table 4 demonstrates the significance of several agents in the students' process of dealing with the print-outs from S.G.I.S. and CHOICES. Males and females appear to do essentially the same things with print-outs, with two noticeable exceptions. Male users of S.G.I.S. appear to make greater use than females of counsellor assistance for the study of S.G.I.S. material. Also, a higher percentage of male users share their S.G.I.S. material with parents or guardians.

The most significant findings to emerge from Table 4 include the high percentages of students who studied the print-outs by themselves, shared them with parents (or guardian) and with friends. Consistent with findings from many research studies, students' parents

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continue to play an important role in student career decision making. The importance of the peer group appears to be about half as significant as that of the parent group.

One might reasonably ask why the school counsellor is not more important in the students' career decision making. Certainly the findings reported in Table 4 above suggest the counsellor is left almost outside the students' study of the important print-out data. Yet, several additional considerations must be noted here. The counsellor may have overseen the students' filling in of the computer cards (S.G.I.S.) or the students' interaction at the terminal (CHOICES). For this reason, there would be little need for the student to re-share the print-out with the counsellor. Also, much of the career guidance counsellor's interaction with students is focussed on the pre-use period, assisting students in their decisions about what data might be researched.

Further, students are often encouraged to be independent decision makers rather than dependent on the services of the career counsellor. The extent to which students study their print-outs on their own initiative supports this point. Additional support for the statement about student independence is shown in the grade breakdown of the data. These data appear in Table 5 below.

As students proceed through the grades, their level of independence appears to increase. Observation of Table 5 shows that as students move from grade eleven to grade thirteen, they are more inclined to study their print-outs on their own and less inclined to share them with parents. Nevertheless, the importance of parental or guardian participation continues to remain high, even for grade thirteen students. Approximately twenty-five per cent of grade thirteen students continue to share their computer print-outs with their parents (or guardians).

TABLE 5

Student Use of Print-Outs from CHOICES and S.G.I.S. Based on Percentage Use by Grade

	GRADE 11 %		GRADE 12 %		GRADE 13 %	
	S.G.I.S.	CHOICES	S.G.I.S.	CHOICES	S.G.I.S.	CHOICES
Shared with a Friend	18.8	19.3	20.3	23.3	20.0	14.0
Shared with a Parent/ Guardian	56.3	45.6	39.1	30.8	25.0	23.3
Shared with a Counsellor	12.5	3.5	17.2	5.0	10.0	4.7
Shared with a Teacher	8.3	0	4.7	1.7	0	0
Shared with myself	37.5	45.6	48.4	58.0	55.0	58.1
Discarded it	0	0	0	1.7	0	7.0

How Did Students Learn About the Availability of S.G.I.S. and CHOICES?

An important concern of those involved with the marketing or implementation of an educational "product" is the study of the most effective means of catching student attention. The researchers wished to determine how students first learned that their school had S.G.I.S. and CHOICES. Further, the researchers wondered how the different sexes learned of the availability of the two systems. Table 6 outlines the findings on this topic of interest.

TABLE 6

Percentages for Males and Females Showing How Each Group First Learned About the Availability of S.G.I.S. and CHOICES

	MALES %		FEMALES %	
	S.G.I.S.	CHOICES	S.G.I.S.	CHOICES
Counsellor	64.2	42.2	45.0	31.2
Teacher	15.1	14.8	28.3	15.1
Friend	5.7	20.3	10.0	32.8
Family Member	1.9	4.7	5.0	3.2
School Announcement	5.7	3.1	5.0	8.6
Guidance Bulletin	1.9	5.5	3.3	3.2
Personal Visit to Guidance Office	5.7	9.4	3.3	5.9

From the above table, one would conclude that the responsibility for implementing both CHOICES and S.G.I.S. was assumed by the guidance staff. Most students appear to have first learned about these systems from a guidance counsellor.

Unfortunately, the relative ineffectiveness of guidance announcements and the use of bulletin boards is difficult to interpret.

Are these communications tools not being used in the marketing of guidance services or are they inherently weak media for informing students?

A further point of interest is the extent to which female students learned about the systems from other students. More than twice as many, and in some instances more than three times as many females as males first learned about S.G.I.S. and CHOICES from friends.

In conclusion, these data on the method of marketing or implementing the systems stress the importance of the guidance counsellor's role, and, to a lesser but also significant extent, the role of student-to-student communication and teachers. Other forms of communication appear to have worked less well.

The data in Table 6 are further described in Table 7 below.

TABLE 7

Information About Students' First Awareness of S.G.I.S. and CHOICES Expressed in Percentages by Grade

	S.G.I.S.			CHOICES		
	%			%		
LEARNED ABOUT SYSTEM	GRADE 11	GRADE 12	GRADE 13	GRADE 11	GRADE 12	GRADE 13
From Counsellor	29.4	48.4	80.0	24.1	47.1	34.9
From Teacher	29.4	29.7	0	17.2	22.3	2.3
From Friend	17.6	4.7	15.0	29.3	9.9	34.9
From Family Member	5.9	4.7	0	1.7	2.5	0
From School Announcement	5.9	7.8	0	3.4	7.4	9.3
From Guidance Bulletin	5.9	1.6	0	6.9	3.3	9.3
From Personal Visit to Guidance Office	5.9	3.1	5.0	15.5	1.4	9.3

One apparent inconsistency among grades is the conclusion that grade thirteen students appear to have received little information about S.G.I.S. and CHOICES from teachers. Additionally, grade thirteen students learned about CHOICES from both counsellors (34.9%) and friends (34.9%).

Level of Student Autonomy When at the CHOICES Terminal

According to the personnel responsible for the development and marketing of CHOICES, the student user does not need the counsellor's full-time assistance while at the terminal. Yet, there is every indication from counsellors that their students require this assistance. A full 64.1% of students using CHOICES had the counsellor (or guidance assistant) sit at the terminal with them. A further 27.2% had help available as needed. (See Figure 2.)

The autonomy of the student when at the CHOICES terminal is different for the four schools. In one school, students had the counsellor (or assistant) at the terminal with them only 27.1% of the time. Another school, however, had the counsellor sit with students 91.5% of the time.

FIGURE 2

Assistance Given to Student Users of CHOICES (Percentages)

SCHOOL #	%
1	49.2
2	81.4
3	27.1
4	91.5

OVERALL

64.1% Counsellor on Location
27.2% Counsellor When Needed

Information from counsellors suggests that the counsellor's presence is essential. Yet, given the inter-school differences, the researchers conclude that neither the CHOICES development staff nor the counsellors are completely correct. To suggest that student users do not need the assistance of a counsellor would be to under-represent the situation. Student users of CHOICES appear to require frequent assistance from a counsellor while the students are at the terminal. However, there is little need for the counsellor to sit at the terminal with students as often as 64.1% of the time. The school that had counsellor (and counsellor assistant) availability at the terminal 27.1% of the time may have the best balance between student autonomy and student dependence.

Location of the CHOICES Terminal

All schools in this study had the CHOICES terminal placed in a prominent position in the main guidance office. Given the nature of the information available from the system, the researchers asked students for their response to the location of the terminal. Student responses which appear in Table 8 below are presented by sex grouping.

TABLE 8

Student Preferences By Sex For the Location of the CHOICES Terminal

	%		
LOCATION	M	F	$\bar{X}$
Main Reception Area of Guidance Office	4.7	2.2	3.8
Private Location in Guidance Office	32.3	23.8	27.8
No Preference	63.0	74.1	68.4

Table 8 shows that most students have no preference about where the CHOICES terminal should be placed. The important finding, however, is that many students prefer a confidential atmosphere for their interaction with the terminal. Approximately one in three males considers his interaction with CHOICES a personal or confidential matter. About twenty per cent of the females would also prefer the privacy.

Furthermore, it is significant that males are more inclined than females to prefer privacy. Personal communication with students demonstrated to the researchers that such information as personal interests, salary requirements and aptitudes were considered by some students to be confidential. A few students resented the fact that the CHOICES terminal was centrally located in the guidance reception area.

What Use Did Students Make of S.G.I.S. and CHOICES?

Table 9 summarizes for males and females the particular uses made of both systems.

Inspection of Table 9 shows that all information available from both S.G.I.S. and CHOICES is well used. CHOICES seems to be most important to students wishing to make a general exploration of personal interests and aptitudes, and characteristics about careers. The "Compare" and "Relate" routes are used less frequently. Also, there are few male-female differences in the data on usage of CHOICES.

Most students using S.G.I.S. are searching for occupational information and educational requirements. The institutions file is a very important component of this system.

Several sex differences apparent in the use of the S.G.I.S. system appear under "Student Loans" and "Job Interviews." Many more females than males use S.G.I.S. for this kind of information. Almost one out of every five females using S.G.I.S. uses it to find out about the availability of loans and information on taking interviews for jobs. One possible interpretation for these findings is that

TABLE 9

Percentages of Users by Sex for Types of Information from S.G.I.S. and Uses Made of CHOICES

	S.G.I.S.				CHOICES		
	%				%		
	M	F	$\bar{X}$		M	F	$\bar{X}$
Occupational Information	71.2	68.9	70.8	USE			
STUDENT LOANS	7.7	18.0	8.0	GET SPECIFIC INFORMATION	58.4	51.9	54.8
JOB INTERVIEWS	3.8	19.7	12.4	COMPARE OCCUPATIONS	29.6	28.1	28.7
INTERESTS	23.1	16.4	19.5	RELATED OCCUPATIONS	22.4	21.1	21.9
INSTITUTIONS	50.0	57.4	54.0	EXPLORE	75.2	74.1	74.5

fewer females are placed in high-paying summer employment. The competitiveness for summer or part-time jobs is greater among females. Also, given the scarcity of summer employment for females, there is increased need for loan assistance.

Student Satisfaction with the Speed of the CHOICES Terminal

In response to a question that asked students about the speed of the person-CHOICES interaction, most students (78.4%) claimed they were satisfied with the speed of the print-out. Another 14.1% found the CHOICES terminal typed the questions and answers too quickly, with only 7.5% reacting to the slow pace.

These data confirm the findings of the CHOICES project team who report that the current speed of the CHOICES system is reasonably well suited to students in secondary schools.

Understanding the CHOICES Print-outs

In contrast to the concerns of the career-guidance specialists about the use of jargon, specialized or technical language and the relative reading level of the CHOICES print-outs, students found them easy to understand. Only three students found the print-outs difficult to understand; 69 found them easy to read and 57 stated they made interesting reading.

Using the CHOICES Terminal

Most students find the CHOICES terminal "easy to use." Approximately one in five who use CHOICES finds it "confusing at first" but quickly gets accustomed to the system.

When one considers the size of the CHOICES data base and the variety of on-line interactions students can have with the system, the relative ease with which students learn to use CHOICES is remarkable. This ease of use criterion can be looked at in another manner, namely "How was your time at the terminal spent?" In response to this question (Question 17, Part A, Student Questionnaire), 113 students reported they spent their time "getting helpful information." Just over 1% of student users spent most of their time finding out how the system works.

Moreover, students made several suggestions about how they might learn more from CHOICES. Table 10 below outlines the number of student responses corresponding to each part of Question 19, Part A of the Student Questionnaire. The respondents to this question were in general agreement that more frequent and longer use of the terminal would enhance their learning.

TABLE 10

Student Responses to Question #19, Part A, Student Questionnaire (Appendix I)

I would learn more from CHOICES if:	# of Responses
I knew more about using the CHOICES terminal	18
I used the CHOICES terminal more often	70
I spent more time when at the terminal	41
I could use the CHOICES terminal by myself	13
I had more counsellor assistance	7

Student Use of S.G.I.S.

A full 78.8% of students using S.G.I.S. were taught the system by a guidance counsellor. Only 13.46% learned,through the assistance of the guidance secretary, how to use S.G.I.S.

In addition, 76.6% of students using S.G.I.S. found it easy to use. It is interesting to note that 13.0% found the S.G.I.S. system difficult to understand. These data are particularly instructive when we compare them to similar data on CHOICES. CHOICES, the more complex system, appears for many students to be easier to understand.

However, caution must be exercised in interpreting this finding since S.G.I.S. users refer only to those students who are also users of CHOICES. The relative significance of those finding S.G.I.S. difficult to use would drop with the addition to the data of responses from students using only S.G.I.S.

Furthermore, students would use S.G.I.S. more often if they had more counsellor assistance (10.2%); if they received their print-out sooner (40.8%); if they knew more about S.G.I.S. (18.4%); and if they did not have CHOICES (30.6%).

The typical waiting period for receipt of S.G.I.S. print-outs, a factor that discouraged use of S.G.I.S., can be looked at according to these data: 8% waited less than a week; 58% waited one week; 28% waited two weeks; and 6% waited more than two weeks. That is, one student in three claims to be waiting two weeks or more for receipt of the computer print-outs from S.G.I.S. Observation of procedures in guidance offices suggests that several days are lost in the sending of students' computer request forms and students sometimes lose time in picking their print-outs up once they are received by the guidance office. By solving these time-delay problems, the waiting period could be reduced by as much as 50%.

Would Students Recommend the Computerized Guidance System to Their Peers?

Both CHOICES and S.G.I.S. are highly recommended by student users. For CHOICES, 92.4% of the student users recommend it to their peers. For S.G.I.S., 94.0% of those who have used both CHOICES and S.G.I.S. would recommend use of S.G.I.S. to their peers.

Which of the Systems Do Students Prefer?

In studying student preferences for either CHOICES or S.G I.S., the researchers collected data only from those who used both systems. Initially, students were asked which system they would prefer if only one system were available in their schools. Student preferences appear in Table 11 below.

TABLE 11

Percentages of Students Preferring Either One of the Computerized Guidance Systems, S.G.I.S. or CHOICES

	%
S.G.I.S.	31.0
CHOICES	44.2
CAN'T DECIDE	24.8

These data suggest, again, that students support both systems. Of interest here is the large group of students, approximately one in four, who cannot decide between the two systems. Clearly, there is stronger support, among students who have used both CHOICES and S.G.I.S., for the CHOICES system. Yet, given the 31% support for S.G.I.S. and the high percentage of "Can't Decide", one can only conclude that each system receives considerable support.

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When the support for the systems is looked at on a grade basis, further analysis is possible.

Observation of Table 12 demonstrates that S.G.I.S. is equally as preferred as CHOICES by students in grades eleven and twelve. Nevertheless, CHOICES is the clear favourite of the grade 13 students.

TABLE 12

Preferences for S.G.I.S. and CHOICES Represented by Percentages by Grade

	%		
	GRADE 11	GRADE 12	GRADE 13
S.G.I.S.	29.4	39.1	15.0
CHOICES	29.4	37.5	60.0
CAN'T DECIDE	41.2	23.4	25.0

Speculation about the grade 13 preference for CHOICES would suggest that the institutions file of S.G.I.S. would have little interest for the senior students, particularly at the latter part of the graduating year. On the other hand, CHOICES broader data base with its interest and aptitude factors would enable the senior students to "check out" the validity of their career plans. Further observation of grade thirteen student users by the research team appeared to confirm this possibility.

How Would Students Respond If They Had Access to Both Systems?

Table 13 shows how students would respond to the availability of both computerized guidance systems.

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TABLE 13

Student Preferences in Percentages for S.G.I.S. and CHOICES When Both Systems Are Available

I WOULD USE:	%
S.G.I.S. Only	10.6
CHOICES Only	18.9
Both Systems	65.5
Don't Know	5.3

The majority of students prefer the use of both. Only S.G.I.S. or CHOICES would be used by 10.6% and 18.9% of students respectively. These data are further illustrated by a grade-by-grade analysis which appears in Table 14.

TABLE 14

Preferences in Percentages for S.G.I.S., CHOICES and Both Systems for Students in Grades Eleven, Twelve and Thirteen

	%		
I WOULD USE:	GRADE 11	GRADE 12	GRADE 13
S.G.I.S. Only	17.6	9.4	10.0
CHOICES Only	17.6	12.5	35.0
Both Systems	58.8	71.9	50.0
Don't Know	5.9	6.3	5.0

Grade twelve students show the highest support for both S.G.I.S. and CHOICES, with 71.9% suggesting they would use each system. Of interest also is the finding that many grade eleven students (35.2%) would use only one system. This decision to use only one system was spread equally between S.G.I.S. and CHOICES. At grade thirteen, however, a full 35% would use only CHOICES.

General Conclusions About Results from Student Questionnaires

General conclusions from the analysis of student responses to the questionnaires are listed below:

(1) The average student would use S.G.I.S. 2.6 times and CHOICES 3.0 times per school year.

(2) Students learn to use both system with relative ease.

(3) Guidance counsellors are primarily responsible for communicating to the students the availability of the computerized guidance systems.

(4) Students frequently wait in excess of one week to use CHOICES.

(5) Counsellors (or Assistants) generally sit with students while students are using CHOICES.

(6) A reasonable percentage of students prefer CHOICES in a private location.

(7) Students prefer to read their print-outs themselves, share them with parents and friends.

(8) All access routes on both CHOICES and S.G.I.S. are used by students.

(9) Students enthusiastically recommend the use of both systems to their peers.

(10) Most students would prefer to have both S.G.I.S. and CHOICES available.

(11) There are grade and sex differences in the use of these systems.

Written Comments from Student Questionnaires

After each of the two parts to the Student Questionnaire, respondents were asked to complete two open-ended statements: "I think CHOICES is," and "I think S.G.I.S. is." The research team included these statements to give students an opportunity to relate personal responses to the two computerized-guidance systems that may not have been elicited by the structured questions.

Responses to the open-ended questions are categorized for each system under "Positive" and "Negative" comments within which sub-categories specific to each system appear. Given the fact that these data are analyzed in detail elsewhere in this report (through other data collection procedures), the research team include for analysis, only the lists of respondents' comments by system.

CHOICES ... POSITIVE COMMENTS

PRINTOUT

- easy to read, specific
- information available right away, fast
- could find out much information at one time

CHOICES ... POSITIVE COMMENTS (cont.)

- large amount of information, covers everything, detailed
- learn about jobs didn't know existed
- aid in selecting courses/schooling to meet job prerequisites
- helpful in exploring careers, probing fields
- helpful to people that don't know what they want to do
- gives thinking about alternative fields of study
- shows wide variety of jobs available for whole country
- good way to start learning about a career
- showed/suggested jobs available now and future prospects
- keeps up with changes/opportunities in the world
- matched interests and aptitudes to job opportunities
- learn about self-interests, capabilities, conditions willing to work under
- gives different outlooks on jobs
- showed attributes about specific jobs, gives a lot of information and insight, helps you know what you're getting into
- compared jobs/their attributes
- helps clean up/confirm ideas
- take home print-out makes research easier and more enjoyable
- simple language, easy to understand, easy to work with, well organized
- useful when used properly
- fun at terminal, liked way computer "talked" to user
- taught lesson to pull up marks because of jobs lost from . . .

CHOICES ... NEGATIVE COMMENTS

- computer gives stupid answers when question not understood
- some information stupid/irrelevant/wrong/outdated/inconsistent
- only gives general information, too general, not specific, only skimmed surface
- didn't have careers students interested in

CHOICES ... NEGATIVE COMMENTS (cont.)

- some of computer's questions were not clear enough
- appointments too short, rushed
- not enough access to terminal, not enough people knew about it
- format too structured
- terminal difficult to adjust to
- time consuming
- sentences/vocabulary difficult to understand/need some explanation
- occupational feedback was unrealistic
- list of careers and number of related topics too large

Worksheet Questions - not specific
- confusing
- not understandable enough
- difficult to answer, need help
- vague
- some unnecessary (same as computer asks)
- not useful
- hard to rank self

Interest Section - was useless, waste of time
- not explained well

Explore - was waste of time
- questions were ambiguous and answers were arbitrary

Aptitudes - if didn't write all #1's, were unsatisfied with print-out
- too arbitrary in decisions on what interests and aptitudes apply to what jobs
- arbitrarily eliminates facts about user in selecting occupations
- everything "black or white", can't hedge on questions which could change number of jobs

Aptitudes (cont.)

- system too sensitive to changes
- some answers were more important than others
- cuts down on job list too quickly
- one answer will change whole output
- only useful if put appropriate information in it
- money question ruined most of occupations wanted
- working conditions ridiculous (don't know how to answer)
- eliminates borderline cases, eliminates some careers after feeding in specific information
- told things student already knew
- no way out of difficulties when made a mistake
- breaks down
- head office overuses system
- guidance counsellor made most of decisions, made student do something other than what wanted to
- things it gave were not related to what student wanted to be, some results were hard to accept
- students may try to answer questions to get the career they want
- confusing if didn't know what wanted to look into
- made student more confused on what to do after school
- shouldn't take information seriously - might influence you to try a career you may not enjoy

SGIS ... NEGATIVE COMMENTS

PRINT-OUT

- hard to understand, hard to read
- impersonal
- not a lot of information
- not specific in some work fields
- comes back "screwed up"
- gets lost in mail

SYSTEM

- awkwardly set up, very confusing, difficult to understand
- boring, not interesting
- didn't have what career student was looking for

TIME

- too slow, many change mind about things (information no longer wanted)

SGIS ... COMPARISON WITH CHOICES

ADVANTAGES

- better approach
- more worthwhile, more helpful
- more people can use it
- easier to get ahold of
- spend less time getting information
- get more information, goes into greater depth
- gives clear understanding about occupations
- gives insight into interviews, loans, etc., which are important to students
- good information about schools and courses
- more detailed information about institutions and job outlines (not found in CHOICES)

DISADVANTAGES

- less enjoyable, less personalized, less interesting, CHOICES is more fun
- more complicated, slower, not as helpful
- not as convenient, not as detailed, not much depth

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- doesn't have the variety of approaches
- no way to compare jobs
- doesn't tell aptitudes
- only gives basic information and not specifics
- CHOICES provides all the information needed

SGIS ... POSITIVE COMMENTS

- easy to use and understand
- print-out is easy to use

INFORMATION ABOUT INSTITUTIONS

- relate universities to courses, or courses to universities
- gave phone numbers, who to contact for more information
- good way to find out about programs
- "gave everything you need to know"

JOB (CAREER) INFORMATION

- good way to get information
- useful even if don't know what you're looking for
- good only if have a predetermined idea of what you want to do

INTERVIEWS

- good way to find out about interviews

6 Evaluating the Effectiveness of Print-Out Material from Two Computerized Guidance Systems

Establishing Criteria

Before beginning a rational comparison of print-out material from the variety of computerized guidance systems, the researchers selected a panel of four career guidance specialists, each with considerable teaching and career guidance experience in secondary schools of Ontario. The career guidance specialists were asked to generate criteria they would use to judge print-out material from computerized guidance systems. They were then given a series of print-outs from both CHOICES and S.G.I.S. The criteria were used to judge these print-outs.

The opportunity to apply the stated criteria to actual print-outs resulted in minor changes and several alterations to the Criterial Scoring Key. Having reached consensus on the criteria to be used for evaluating print-outs from computerized guidance systems, the career guidance specialists were independently introduced to print-outs from both S.G.I.S. and CHOICES.

Rational validation of the scoring key was achieved when consensus was reached among secondary school counsellors, teachers and students regarding the comprehensiveness of the instrument and the ease with which it can be applied. The only points of disagreement among this selection of agents centred on the ordering of criteria in the scoring key. Since the order of the criteria listed in the instrument (Table 15) proved to be most acceptable to the career guidance specialists, it was retained and used in its original form.

Table 15 below outlines the criteria used in the scoring key. Observation of Table 15 demonstrates that there are three major categories by which computer print-outs from computerized guidance

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systems are judged: Descriptive Content; Style; Prescriptive Content. Each of these major categories is then sub-divided into a series of more specific criteria (See Table 15 below).

TABLE 15

Scoring Key for the Evaluation of Print-outs from Computerized Guidance Systems

I. Descriptive Content

- (a) Sufficiency of Information
- (b) Accuracy of Information
- (c) Relevance of Information
- (d) Currency of Information

II. Style of Presentation

- (a) General Attractiveness of Print-out
- (b) Use of Spacing
- (c) Suitability of Reading Level
- (d) Use of Jargon or Specialized/Technical Language
- (e) Extent of Unified, Coherent, Interesting Presentation of Material
- (f) Balance in Presentation of Information

III. Prescriptive Content

- (a) Suggestions for Finding Additional Information About This Career
- (b) Suggestions for Relating This Career to an Occupational Field (Cluster)
- (c) Suggestions for Use of Counselling Services
- (d) Developmental Implications in Follow-up Suggestions

Results of Criterial Scoring of CHOICES and S.G.I.S. Print-outs

Descriptive Comment

(a) Philosophical Orientation to S.G.I.S. and CHOICES Information Dissemination

To appreciate fully the extent to which S.G.I.S. and CHOICES present information on careers, one must understand the different approaches used by each delivery system. S.G.I.S. purports to deliver information about careers and training or educational opportunities. Philosophically, the S.G.I.S. delivery system focusses on the specific career. The intention is to present a complete description of the career and the concomitant training or educational requirements. Little attention is given to the interests, aptitudes, values or expectations of the person seeking information about the world of work. S.G.I.S. gives information about careers; the information seeker has a responsibility to relate this information to himself or herself.

CHOICES, on the other hand, encourages students to begin with personal interests or attributes and then relate these to vocational opportunities that have been proven to correspond to such person-centred information. CHOICES begins with the individual and "takes" the individual to the world of work. S.G.I.S. is an information system that focusses on the world of work, leaving the appraisal of personal qualities, interests, and aptitudes up to the individual.

(b) Sufficiency of Information

S.G.I.S. gives considerably less person-oriented information than CHOICES. Worker attributes are frequently described in considerable detail, with a general emphasis on job description, training and education, and, in some instances, associated lifestyle. Many career descriptions are taken directly from the Canadian Classification and Dictionary of Occupational Titles (C.C.D.O.), with only

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infrequent changes made. To the extent that S.G.I.S. offers information about careers, the print-out material appears to be relatively complete.

CHOICES gives brief career descriptions adapted or taken directly from C.C.D.O. These general descriptions are, in some instances, less detailed than those that appear in S.G.I.S. However, CHOICES also has available information about interest factors, temperament factors, hours of work/travel, environmental conditions, physical impediments, data-people-things factors, physical demand, general aptitudes, indoor/outdoor factor, future outlook, earnings, educational requirements, and training requirements.

Each of the two systems purports to offer detailed career information. Indeed both S.G.I.S. and CHOICES do provide students with such information about careers. The significant points of departure, however, are shown in the two systems' responses to the comprehensiveness of coverage of careers available in Canada and the characteristic approaches taken by the two systems with regard to presenting information about each career.

S.G.I.S. includes information on a total of 6000(+) careers available in Canada. This careers list covers not only those careers most frequently selected by the Canadian work force but also such esoteric careers as match-head dipper, tumbling barrel operator and acid tester.

CHOICES offers comprehensive coverage of only 650 careers representing approximately ninety percent of Canada's working population. Given the fact that the CHOICES system includes very elaborate computer programming and an expanded information base relative to career information, this limitation on the number of careers available within the system seems reasonable.

Thus, sufficiency of information can be reduced to a two-edged sword. With CHOICES, a student is limited in his or her career searches to complete information on only 650 careers. With this system, however, the information is handled in such a manner that the student looks first at "self" and then at careers that are rationally associated with these personal attributes. The obvious advantage here is that more personalized information is available on a limited number of vocational opportunities.

With S.G.I.S., students have access to relatively complete descriptions of 6000(+) careers extant in Canada. These careers are classified according to career groups. Given the current instability of the market place and the rapid changes in the world of work, this coverage of 6000(+) careers may well be preferable for some students to the CHOICES data base.

(c) Accuracy of Information

Both S.G.I.S. and CHOICES information systems have very few major inaccuracies. Since each career differs somewhat depending upon the uniqueness of the person-work environment interaction, the two computerized guidance systems present general descriptions of careers. To the extent that a specific worker describes the characteristics of his or her work different from the stated characteristics of the print-out classification, we have a relative inaccuracy.

Yet, apart from inaccuracies associated with the data reduction necessitated by applying a classification scheme to the world of work, neither S.G.I.S. nor CHOICES has many blatant inaccuracies. Each system, however, presents elements of labour market forecasting that are open to question either on a local, regional, provincial or national basis. In several instances, minimum or maximum wages are inaccurate. In conclusion, the information on vocational opportunities is frequently exaggerated. The claims suggest more opportunity for employment than, in fact, existed at the time this research project was conducted. Similarly, in that each system attempts to present "the general case", several of the descriptive characteristics of careers or of personal factors (CHOICES) are highly questionable. The teaching market is described as "stable"; the personal characteristic "interest in people" is not included in the CHOICES print-out on "psychologist" (a point corrected on CHOICES in June 1978).

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(d) Relevance of Information

Relevance of information presented by the S.G.I.S. system can be looked at in several ways. Do the print-outs give a balanced look at the essential characteristics of careers in the general case? Also, is information on careers relevant to the informational needs of adolescents in secondary schools? In terms of the former question, the career guidance specialists noted for several career descriptions that apprenticeship opportunities are given scant coverage with few relevant details presented. Additionally, lifestyle characteristics of workers in particular careers are not presented. This information would be consistent with the general aims of S.G.I.S.

Students in secondary schools using S.G.I.S. appear to be interested in characteristics of careers, educational and training requirements and lifestyle characteristics associated with careers. Often, what may appear to be extraneous material about work environments is, in fact, critical information for some students. In instances where this kind of information is omitted, students leave the system unsatisfied.

The reverse is also noted. With S.G.I.S., students are very willing to complete the computer cards in such a way as to receive maximum information about a career. Such information overloading may result in some students receiving superfluous common-knowledge data when its relevance for a particular student is questionable. Alternately, many students receive so much relevant information that they need assistance in the assimilation of the data. The best control for such instances of information implosion appears to be a suitable introduction to the features of the S.G.I.S. system. Without such an orientation, students typically make global requests with little attention paid to their more relevant queries.

With CHOICES, relevance can be looked at in terms of the extent to which information provided by the system is important to the user's matching of personal attributes with work environments. The difficulty some students seem to have with CHOICES is the volume of both person-oriented and career-oriented data. The student who lacks a clear plan for career exploration frequently collects such vast quantities of information that he or she cannot reasonably deal with the print-out. In actuality, the CHOICES data base is not, in this instance, to be faulted. Rather, the researchers are aware of many instances in which users (particularly in the intermediate grades) request more information than could possibly have relevance for them. A period of considerable floundering appears to follow such practices, followed by a fixation on only a minimum amount of relevant data.

Morever, users of CHOICES have greater control over the data base, thus controlling to a greater extent the amount of relevant information they wish to receive. Since the user can "negotiate" with the system, he or she can select from personal or career factors only those that at a given point in time are highly relevant. This issue of "relevance for whom" is a fundamental strength of the interactive system.

Relevance may also be looked at in terms of the extent to which the information presented suggests an objective balance among the critical person- and career-oriented elements. In this area, the researchers found that S.G.I.S. offers a more general, balanced look at many careers. CHOICES appears to "turn every stone," a positive feature indeed, except that the decision is left to the user to decide the relative importance of all informational factors. For the younger student, then, S.G.I.S. determines to a greater extent what information should be considered. This same student, when using CHOICES, has difficulty deciding the number of person- or career-related factors that should match if his or her exploration is to be "validated."

Relevance of information, when looked at in terms of the essential information in the data base of either system, leads the researchers to conclude that CHOICES covers a wider range of important person- and career-related data. When relevance is looked at in terms of the degree to which students receive relevant, general descriptions of careers with minimal opportunities for information overload, the researchers are left with a cautionary note about the

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use of both systems. A student user of S.G.I.S. could receive so much information that he or she is unable to see the relevance of the career description. On the other hand, the same user behaviour when using CHOICES would result in an even greater overload of information. In this latter instance, the system does not give only a relevant description of a given career. Rather, CHOICES takes account of a wide variety of factors that are considered to be relevant in an individual's exploration of self and of the world of work. For the relatively uninformed student, all this material is too much, too soon.

(e) Currency of Information

There is a close relationship, for computerized-guidance printouts between accuracy and currency of information. One might readily deduce that salary expectations for a particular career are inaccurate. Nevertheless, in instances such as this one, the question of currency of information may well be the important factor. That is, the salary range presented on the computer print- out may have beem accurate at the earlier date when it was introduced to the data bank.

In the judgment of the career guidance specialists, both S.G.I.S. and CHOICES have in their data banks material that is not current. Students relying on information about institutions and, in particular, specific programs at colleges and universities, require other information as well. In the S.G.I.S. institutions data base, there appears to be a lengthy lag time between the announcement by a college or university that a new program is available, or an existing program is cancelled, and S.G.I.S. response to the current information.

Similarly, both S.G.I.S. and CHOICES rely heavily on career information from the C.C.D.O.. Although this source of information gives the most comprehensive treatment of careers in Canada, there is a need to update many of these career descriptions. Typically their general outline of a given career is relatively accurate but current changes in career areas and within specific careers are often not included.

To illustrate, S.G.I.S. does not mention entrance limitations and job prospects for the experimental psychologist. Also, CHOICES states that the career "insulator" is "stable" when the career guidance specialists unanimously agree that there are increasing opportunities for insulators. Under Hairdresser and Police Constable (Railway) the S.G.I.S. system uses 1975 salary figures. The currency issue is again aroused. The same can be said of Computer Peripheral Equipment Operator on CHOICES. Salary figures are out of date. Educational requirements and the need for finger and manual dexterity appear to be lower than the actual requirements in these areas. In each instance, the issue of currency of information requires further study. Changes in entrance "requirements" to both the world of work and "related" college training programs would suggest a demand for higher educational levels. Also, recent changes in equipment place increasing demands on finger dexterity.

Clearly, one of the most difficult tasks is the development of an information base for a computerized guidance system is the development of accurate career descriptions. The career guidance specialists take exception to those instances in the print-outs from each system in which information is grossly out of date. Cited in the preceding paragraphs are only a representative few of the outdated information "bits" available from both S.G.I.S. and CHOICES.

Style of Presentation

(a) General Attractiveness of Print-out

Neither the S.G.I.S. nor the CHOICES print-outs offer students an attractive, colourful, easily manipulated print-out. In the judgment of the researchers, the printouts, upon first inspection, look bland, uninteresting, and onerous. Research on other computerized guidance systems confirms that the issue of general attractiveness of print-out material requires considerable study.

No textbook, magazine, newsletter drafted in the style of the computer print-out would gain the notice of the reading public. Computerized guidance print-outs from both S.G.I.S. and CHOICES are read because students have a need to know specific information. However, a student's initial response to a rather bland print-out may decrease his or her motivation to complete the reading with a high level of intention. For the weak reader, the unattractive print-out with its flimsy paper and accordion folds is an obvious detriment to research.

(b) Use of Space

CHOICES print-outs appear to make better use of spacing than the S.G.I.S. system. In that CHOICES is an interactive guidance system, there is a balance between lengthy listings of material and terse questions and answers. The net effect of this type of printed interaction is a less cumbersome and more inviting use of space.

S.G.I.S. does not record the questions and answers of the user, which are submitted on computer cards. The print-out includes long lists of information, left unbroken by appropriate use of space. For the reader, the issue of spacing becomes a very significant factor since computerized-guidance systems result in print-outs that are incredibly uninviting.

CHOICES offers another use of spacing that further increases its acceptability. The tabling in CHOICES of comparative data results in summary lists that are easily read and relatively inviting. These lists include spacing that does not violate the natural left-to-right eye pattern of the typical reader.

Furthermore, in that CHOICES is an interactive guidance system, there is considerably more reading for students to complete. For this reason, the nature of the print-out material is much more important to the user than it is to the user of the S.G.I.S. "batch" service. A student requesting information from S.G.I.S. receives only the requested information and not a complete transcript of the user-computer interaction.

Related to the preceding difference in the print-outs is the need for spacing that enables the user to conveniently return to the print-out for additional study. The researchers had difficulty relocating information in each print-out after leaving the print-out and returning for further reading of the material. The shorter S.G.I.S. print-out and its lack of user-computer interaction results in an easier return to the print-out. With the CHOICES system, the use of space and charts or tables increases the ease of initial reading but has a concomitant disadvantage. Students wishing to restudy the information or share significant parts with parents, friends and counsellors had considerable difficulty in relocating sections of interest.

In summary, S.G.I.S. material requires greater use of spacing, listing, underlining, and paragraphing. Younger students are sometimes intimidated by the appearance of the material on the print-outs. CHOICES uses a more convenient line width, increased use of white space and frequent charts or lists. A commonly cited disadvantage to the CHOICES system is the fact that a student has a difficult time relocating information in the more voluminous print-out.

(c) Suitability of Reading Level

Observation of tests of readability demonstrates that sentences become longer and structurally more complex and the vocabulary becomes more advanced as the intended grade level of material rises. Since both CHOICES and S.G.I.S. were studied in the Ontario Secondary School context, the researchers wished to know if the readability of print-outs was suitable for both regular (4-Year) and advanced (5-Year) students from grades nine to thirteen.

Before selecting any one of the highly controversial approaches to the study of readability, the researchers identified three potential strategies:

(1) the application of valid and reliable tests of readability to sample print-outs;

(2) the responses of the career guidance specialists to suitability of reading levels of print-outs;

(3) the responses to suitability of reading levels of print-outs from student users from all grades and programs.

Given that approaches (1) and (2) above are used to enable researchers to predict student reactions to the suitability of reading level of print-out materials, the researchers selected the third approach. Thus, no tests of readability were applied and the career guidance specialists' reactions were recorded but are not summarized here. Rather, students were asked for their personal reactions to readability of print-outs. A summary of these data appears elsewhere in this report.

(d) Use of Jargon and Specialized/Technical Language

Material from both S.G.I.S. and CHOICES is replete with highly technical terms, specialized language and use of professional jargon. All career guidance specialists, the research team, school counsellors and students across the grades reacted to this use of language in the print-out materials.

For the senior student about to enter a college program in Aerospace-Engineering Technician, the use of such terms as "ancillary equipment" and "aerodynamic probes" makes considerable sense. To this hypothetical student, considerable background reading along with select academic/vocational experiences have probably resulted in a working knowledge of such vocabulary. For the grade nine or ten student beginning a general exploration of careers, the language is inhibiting.

The researchers observed students asking what "temperaments" and "impediments" were (CHOICES system). Additionally, the use of such contractions as O.S.S.H.G.D. on the S.G.I.S. system is not readily understood by many students. Also, terms like "urbanization" and "phenomena" on the S.G.I.S. print-out for Social Worker or "sedentary" and "monitoring" in the same career print-out from CHOICES are merely a few examples of language barriers posed by these computerized guidance systems.

Given the range of student knowledge about careers and skill in reading, both systems often discourage student comprehension. Several changes in each system would remedy this problem of professional jargon and specialized/technical vocabulary. One approach would be to have the student receive a print-out geared to the reading level of his or her grade. The student in grade nine would then receive much less technical or specialized language than the senior student.

A further change worthy of consideration would be to have two types of descriptions for each career. These career descriptions would enable students to request either a concise but "low-level" vocabulary version of careers or a relatively complete, "high-level" vocabulary description of careers that included "sufficient" specialized/technical vocabulary.

A final consideration would be the inclusion after each career description of a list of jargon or specialized/technical words along with suitable definitions. The relatively uninformed student would then have an opportunity to understand the intention of the comprehensive career description without having to spend time searching for definitions on his or her own. The researchers have found, too, that many of the specialized/technical terms are available only in the larger dictionaries and, in some instances, in dictionaries designed for use in specialized work environments.

Each of the computerized guidance services must respond to the issue of vocabulary. Neither system offers consistent use of vocabulary suited to the heterogeneous population of students in secondary school.

(e) Extent to Which Presentation of Material Is Unified, Coherent and Interesting

Two global concerns of students relate to the lack of a unified and consistent developmental sequence to the S.G.I.S. material and the existence of repetitive interactive comments in the CHOICES print-outs. For S.G.I.S. users, the global concern results in career information presented in unbroken, rapid-fire selections that demand unrealistically high levels of concentration. The natural progression appears only in the move from career descriptive material to training requirements. This positive feature of the S.G.I.S. print-outs is largely obfuscated by the uninteresting enjambment of career-related facts. One has only to review a print-out on "Physician" to fully appreciate the lack of order to and progression within the career description.

For CHOICES users, the career description is only a small part of the important material presented. The basic descriptions of careers, however, lack stylistic flair in the same sense that the S.G.I.S. material that is C.C.D.O.-related is factual and largely uninteresting reading. Many students respond negatively to these descriptions of careers, although the main source of criticism about print-outs from CHOICES is the seemingly unnecessary repetition of information.

Students using CHOICES for the first time find the interactive comments dispersed between the requested information sequence to be original and highly interesting. The highly personalized nature of the question-answer format is readily appreciated. After a lengthy sitting at the CHOICES terminal or upon subsequent use of the system, students can become bored with repetition of lengthy, interactive material.

Members of the research team observed that students made errors because the repetition of material relating to user-computer "conversation" reduced student interest and caused inadvertent scanning rather than accurate attention to specific details. Fortunately, the computer controls for such behaviour in that improper responses typically result in "I do not understand your answer. Please try again."

The essential distinction to be made between the level of interest generated by the two computer guidance systems results from the characteristic features of a "batch" versus "on-line" delivery system. Interest in the print-outs from S.G.I.S., the "batch" system, must come from the manner in which the career-related material is presented. When this material is not presented in a sequential, logical manner, some students have a negative reaction to it. Without an interesting format, S.G.I.S. material fails to capture high levels of interest from the modestly motivated student. CHOICES, however, has more opportunity for engaging user interest. Through a series of interactive comments, the system readily captures the user's involvement and then tailors the person-related information to appropriate career information. For many students, the fact that the system starts with personal queries seems to predispose them in terms of a positive commitment to the career-related information. This interactive system has several features that potentially stimulate user involvement and interest. When this factor is coupled with the immediacy of the feedback, the combined effect may result in heightened involvement.

(f) Balance in the Presentation of Information

Print-outs from both S.G.I.S. and CHOICES can be looked at in terms of a balanced representation of career-related information. The career guidance specialists describe the need for an accurate description of: what the worker in a career does; the characteristics of the career environment; salary range; required worker attributes (interests, apptitudes, values, knowledge/skill); and training or educational requirements.

Good computerized guidance print-outs present an interesting and balanced coverage of these topics. Whereas some careers are best described in such a manner that more information needs to be presented on one or a few of these topics, the majority of career descriptions must give a balanced coverage of these important components. In this regard, print-outs from both systems could be improved.

Neither system offers in the general descriptions of careers an interesting balance of pertinent information. These descriptions, in the judgment of the career-guidance specialists, are limited representations of only a few critical features of careers. Nevertheless, with S.G.I.S., and particularly with CHOICES, the basic information describing specific careers can be enhanced by other career-related information - such as educational/training institutions offering courses leading to the career; and factors such as interests, temperaments, and environmental conditions. CHOICES lacks the institutions data; S.G.I.S. could readily include the other kind of data.

Prescriptive Content

The career-guidance specialists are in unanimous agreement that a student's career search should not cease in the exploration or insight phase. The student should be given constructive suggestions for further exploration and action plans. Without this "prescriptive" content, the career guidance specialists suggest that the computerized guidance system becomes a mere prosthesis. The student asks the questions and is fed answers. The underlying concern appears to be the student's dependence on the information system without the concomitant resolve to aggressively seek out other information to supplement his or her understanding. Additionally, the dependent demeanour may discourage the student from initiating and implementing rational action plans.

Yet, in an attempt at applying the first criterion under the heading "Prescriptive Content" the career guidance specialists identified a significant factor that could invalidate the comparison of print-outs from S.G.I.S. and CHOICES. The point is that CHOICES offers a more comprehensive description of person- and career-related information. Because S.G.I.S. contains briefer descriptions of person- and career-related information, there is increased need for this information system to include more suggestions for student gathering of additional data.

Apart from the application of this one criterion, however, the career-guidance specialists had little difficulty in applying the remaining criteria under the major heading, "Prescriptive Content."

(a) Suggestions for Finding Additional Information About This Career

S.G.I.S. makes frequent suggestions regarding means by which student understanding of careers might be augmented. There are excellent "tie-ins" with other occupations, suggestions about relationships with other careers in the "Minor Group", comments about required subjects in secondary school, pamphlets or booklets for which the user might apply and addresses to be checked for specific vocational information. Furthermore, students are encouraged to share their print-outs with counsellors and parents.

One major improvement that could be effected in the S.G.I.S. system would be a series of follow-up questions that could both test the student's knowledge and understanding of the career information and form the basis for further study.

In the judgment of the career guidance specialists, CHOICES offers fewer suggestions than S.G.I.S. for students to use once they have left the CHOICES system in making additional inquiries about careers. There are numerous within-system routes students can follow for detailed career-related information and the matching of person- and career-related data. Beyond these exploratory routes, students are given few cues as to where and how they might research to get other information. CHOICES encourages users to share their print-outs with parents and counsellors. In an indirect sense, this sharing directs students to agents who have career information.

(b) Suggestions for Relating Careers to Occupational Fields

Both S.G.I.S. and CHOICES use classification systems for careers. S.G.I.S. uses Major and Minor Groupings of Careers. These career groups are fully described in the S.G.I.S. Master List of Careers. In addition, the Master List includes a complete index of career descriptions available from S.G.I.S., complete with the appropriate C.C.D.O. codes.

The CHOICES system approaches relationships between or among careers in a different manner. Two approaches to the system's occupations file, "COMPARE" and "RELATE", enable the user to study specific occupations and their similarities and differences. For example a student may wish to compare occupations based on:

Interests
Aptitudes
Temperaments
Education Level
Environmental Conditions
Future Outlook
Earnings
Hours of Work/Travel
Physical Demands
Physical Activities

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Indoor/Outdoor Considerations
Training Requirements
Data/People/Things Relationships
Occupational Fields
Summary of Work Performed

Additionally, a student can use the CHOICES system to find careers similar to a career about which the student has positive interests. As explained in a Guide to CHOICES (Field Test Only), p. 31, Part VI: "if you wanted to find occupations related to Farm Machinery Operator, you would tell CHOICES the things you like about this occupation. CHOICES would then list for you occupations that are similar." Similar to S.G.I.S., the CHOICES Occupations File uses C.C.D.O. code numbers for careers and C.C.D.O. Major Groups for occupational fields.

(c) Suggestions for Use of Counselling Services

Neither CHOICES nor S.G.I.S. purports to replace the guidance counsellor. In studying print-outs from both systems, however, the career guidance specialists remarked that few suggestions are made to students about how they might use the services of the guidance counsellor either during their career exploration or after exiting from the system.

Both S.G.I.S. and CHOICES are accompanied by pamphlets and manuals for use in orienting students to the systems. At this initial phase of a student's involvement, the student is typically informed that "you are strongly encouraged to discuss your print-out with your counsellor, family friends or others who can help you make the difficult decision you face regarding your future." Also, the researchers observed counsellors encouraging students who appeared to have need for additional assistance to make use of guidance services that were available.

Nevertheless, the printed material from both systems does not routinely encourage counsellor assistance, nor do the systems make suggestions about what type of follow-up counselling could be requested. This kind of assistance is particularly important for students in grades nine and ten who are relatively unsophisticated in their requests for help from counsellors. Moreover, without the encouragement to discuss career plans with the counsellor, many students leave the S.G.I.S. or CHOICES system with only superficial follow-up study of the information gleaned.

(d) Developmental Implications in Follow-Up Suggestions

If career development or career maturation is a process, one would readily expect that computer-generated suggestions for student follow-up would reflect, at least implicitly, a developmental approach to exploration and action. That is, the grade nine student interested in careers in medicine and health usually would not require the same suggestions for follow-up exploratory activity as the grade thirteen student. For the grade nine student, a suggestion about a careful analysis of the minor groups of occupations under this major group could offer ample specificity for further exploration. The student could then research the distinctions among Health Diagnosing and Treating Occupations; Nursing, Therapy, and Related Assisting Occupations; and Other Occupations in Medicine and Health (S.G.I.S.).

Typically, the more mature student would respond favourably to specific information that could be used to refine further an already focussed appreciation of a particular minor group or individual career. Having progressed through earlier phases of the career development process, the senior student usually wants a different kind of assistance for his or her continued career exploration activity.

For the CHOICES user, orientation to the system includes suggestions about the variety of points of entry available to the career exploration process. The student is then encouraged to proceed in the interactive mode according to self-determined career information needs. The system, in this manner, responds to student needs depending upon levels of career maturation reflected by the types of information requested.

The career guidance specialists readily endorse the implications for developmental guidance inherent in such an orientation package. The system could further this intention by offering step-sequenced suggestions for follow-up activity after the student has left the computer.

S.G.I.S. does not encourage the use of a student worksheet prior to use of the system. The system does not predispose students to follow a career exploration process that is developmentally sound. Rather, students are introduced to the system's capabilities and then they begin to fill in computer card request forms based on personal choice. Without the orientation to the system and the use of a worksheet such as is used with CHOICES, students appear to be left without the assistance of subtle cueing.

A final limitation of the prescriptive content of S.G.I.S. apart from the paucity of such data in the print-outs is the lack of ordered steps to be used in student follow-up activity. Typically, very few suggestions for follow-up are presented and these suggestions almost always relate to how students can find more information. S.G.I.S. would be greatly improved by the inclusion of follow-up suggestions that appropriately engage students at various levels of their career maturation processes. These follow-up suggestions should deal with both informational needs and process-oriented needs such as what a student might do with his/her print-out; the value of careful study; and the need to relate the information to personal interests, abilities and values.

General Information Regarding Use of the Criterial Scoring Key by the Career-Guidance Specialists

Print-outs from computerized guidance systems are extremely difficult to evaluate. This difficulty arises from the novelty of the mode of communication and the relative paucity of criterial scoring keys. The researchers were not able to locate a scoring key expressly suited to the range of criteria required of a comprehensive study of print-out materials.

Moreover, in the application of the criteria to computer print-outs, the career-guidance specialists frequently appear to have been contradictory. Closer inspection of the judgments of the specialists suggest that apparent contradictions in statements about both CHOICES and S.G.I.S. print-outs resulted from "within-systems" variability. That is, some career descriptions are very complete, easy to read, accurate, and so forth. Then, within the same computerized guidance system, other career descriptions may be relatively incomplete.

For this reason, data from the application of the Criterial Scoring Key appear in two distinct forms. Initially, a rational analysis of the application of the criteria was presented. For statistical purposes, however, the data from the Scoring Key were numerically scored and analysed using the Sign Test (Non-Parametric). This latter approach enabled the researchers to make comparisons of print-outs from CHOICES and S.G.I.S. based on statistically significant differences in these systems.

Furthermore, each of the two computerized-guidance systems has a data base suited to a different mode of computer-user interaction. S.G.I.S., the batch service, does not use the carefully designed, interactive conversational sequence used by CHOICES. Similarly, CHOICES did not have an institutions file at the time this research was conducted.

Therefore, in the interest of fair comparison, the two data bases were compared using only the career-related information available on both systems. Assuming student interest in careers would remain constant for each system, the researchers randomly selected careers (from approximately 180,000 requests for information from S.G.I.S.) based on the proportion of time these careers were selected by students. Thirty-four of these selections were then matched with selections from CHOICES.

Print-outs on all career-related information for these careers available on CHOICES and S.G.I.S. were proviced by the Occupational and Career Analysis Development Branch of the Federal Government and the Ontario Ministry of Education respectively. The career-guidance specialists made comparative analyses of this career-related information, selectively omitting features and information from both systems that could not be included in the fair comparison.

7 Additional Types of Evaluation of Two Computerized Guidance Systems

Statistical Comparison of Data Bases of S.G.I.S. and CHOICES

The research team used random integers between 1 and 180,000 to randomly select careers proportional to the number of times these careers were accessed on the S.G.I.S. system. From this random listing of careers, thirty-four matching careers were found on the CHOICES system.

A panel of career-guidance specialists studied information available on each system relating to each of the careers. Data from the career-guidance specialists' application of the Criterial Scoring Key were used to make estimates of the comparative value of the two data bases for the dissemination of career information. To make comparative analyses, comments made in the applications of the Criterial Scoring Key to the thirty-four career matches were listed and scored. The following scoring procedure was used to determine for each career description which system, S.G.I.S. or CHOICES, was superior on a stated criterion:

Score	On this criterion:
+ 1	S.G.I.S. is best.
- 1	CHOICES is best.
0	Both systems are good.
- 0	Neither system is favoured.

The Sign Test for non-parametric data was used to determine the relative strengths and weaknesses of each data base. Using

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the random sampling of careers from S.G.I.S. and the matching set of careers from CHOICES, the research team estimated the relative strengths and weaknesses in the total data bases of each system.

Two applications of the Sign Test for non-parametric data were made. One of the tests offers a "conservative" and the other a "liberal" interpretation of the data. The differences in the applications of the Sign Test result from the manner in which "ties" in the data are handled. For the former application, ties are split such that each of the two systems under study receives a "½" score. The latter test treats tied scores by disregarding or ignoring them. Each application of the Sign Test is an acceptable statistical procedure. The particular approach chosen depends upon the level of risk one is willing to entertain in the interpretation of results. For convenience, results from statistical analyses using both applications of the Sign Test are reported in Table 16.

TABLE 16

Statistically Significant Results from Two Applications of the Sign Test for Non-Parametric Data to Data Bases for S.G.I.S. and CHOICES.

Criteria	Data Base	Sign Test Application ("liberal")	Sign Test Application ("conservative")
1 (a)	S.G.I.S.	$P < .05$	
1 (b) + (d)	S.G.I.S.	$P < .01$	- - -
2(c)	S.G.I.S.	$P < .01$	$P < .05$
3 (a) + (b)	S.G.I.S.	$P < .01$	$P < .01$
3 (c)	S.G.I.S.	$P < .01$	- - -

Clearly, observation of Table 16 demonstrates the advantages of the two applications of the Sign Test for non-parametric data. Whereas the more "liberal" application is equally as plausible, the researchers have chosen to discuss the "conservative" approach first. Criteria 2 (c) and 3 (a) + (b) from the Criterial Scoring Key are better met on the data base for S.G.I.S. with statistical significance at greater than .05 and .01 respectively.

This means that in the judgment of the career-guidance specialists the career-related information within the S.G.I.S. data base uses a more suitable reading level than does the CHOICES data base. Additionally, a combination of prescriptive content criteria, namely "suggestions for finding additional information about this career" and "suggestions for relating this career to an occupational field" are better applied within the S.G.I.S. data base.

There are several significant questions that result from these statistical analyses. Initially, "On what basis might one conclude that the reading level of the S.G.I.S. print-outs on career-related information is more suitable than that of the CHOICES system?" Further study of the career-guidance specialists' comments about the application of this criterion to the sampled careers from both systems introduces two important facts. Much of the criticism to the CHOICES use of inappropriate reading level stems from use of vocabulary such as "temperament," "impediments," "clerical perception," "finger dexterity" and so forth. Since the S.G.I.S. system does not give career-related information in the factors for which this vocabulary is used in the CHOICES system, the test of readability may be an "unfair" comparison. The fact is, however, that the less mature student would typically have a more difficult time engaging the CHOICES content.

A second consideration with regard to the readability level of the CHOICES material is the apparent language "congestion" in the general career description. These general descriptions of careers, in many instances very similar to the descriptions used on S.G.I.S., often demand a level of reading beyond the expertise of the grade nine student.

Nevertheless, the important disclaimer that can be introduced by the on-line specialist is that the student using the CHOICES' system can decide not to access the more complex general descriptions of careers or the high-level vocabulary factors. This point must be recognized in the assessment of relative suitability of reading level within the S.G.I.S. and CHOICES data bases.

The other point of departure between the two data bases appears to be the greater extent to which S.G.I.S. makes prescriptive suggestions about how students can obtain additional information about careers and about how individual vocations fit into career groups. Yet, as in the previous criterion, "level of reading", these two criteria must also be interpreted. S.G.I.S. does include in its data base many excellent suggestions for student researching for additional, relevant information. Such suggestions encourage more complete analysis of the world of work and, potentially, increases in independent inquiry.

CHOICES, an interactive system, offers fewer suggestions for further research since its data base, relative to the same careers as appear in S.G.I.S., is much more complete. CHOICES does not need to have students write away for information on "hours of work/travel" and so forth. These are readily accessed by the student user. The apparent advantage of S.G.I.S., then, may be less of an advantage than one might initially assume. The process involved in a student's personally drafting a letter to send for additional information about a given career may, however, heighten the student's level of autonomy or independence. To the extent that S.G.I.S. offers more encouragement for exploration after a student exits from the system, it contributes to this latter intention.

Moreover, the S.G.I.S. print-outs frequently encourage students to continue exploration in the minor career group area. The career under review is therefore "located" within a career group. When students receive their print-outs, they have often forgotten the Major or Minor career groups from which a career code was selected. Thus, frequent mentioning of such occupational fields is an asset.

The apparent disadvantage experienced by the CHOICES' user is accounted for through the availability of the "Compare" and "Relate" access routes. The print-out on a career description may not typically identify related occupations; the on-line interactive process continually reintroduces the user to the access routes through which such information is made available.

In conclusion, the career-guidance specialists favour the S.G.I.S. data base relative to the suitability of reading level; suggestions by which students can independently search for additional career-related information; and, the frequency with which researched careers are identified with occupational fields. These conclusions require interpretation within the context of the different processes involved in "batch" and "on-line" systems. Furthermore, these conclusions present statistically significant differences resulting from only the more conservative application of the Sign Test for non-parametric data.

Effects of S.G.I.S. CHOICES on Career Maturity

This research project did not set out to relate the implication of either S.G.I.S. or CHOICES with gains in student career maturity. Nevertheless, a fortuitous turn of events enabled the researchers to report on findings from two research studies that focus on this relationship.

(a) Excerpts from An Assessment of the Effects of a Computer-Assisted Career Information Service on the Career Maturity of Ontario Students in Grades Nine, Ten and Eleven, a study completed by one of the principal investigators in the present study, appears in Appendix II. Results from this empirical study demonstrate that S.G.I.S. positively affects the Career Maturity Attitude of students. Moreover, in some secondary schools, student users scored gains in Knowledge of Self, Occupational Information, Goal Selection and Occupational Planning.

Another interesting conclusion of the study is that even for students not requesting to use S.G.I.S., prescribed use of the system resulted in significant gains in career maturity attitude and in differential gains (depending upon one's grade, sex and school) in the other listed areas.

The latter interactions between/among grade, sex, and school point in the direction of appropriate implementation of S.G.I.S. Few secondary schools in the Province of Ontario have clearly articulated plans for the implementation of S.G.I.S. Similarly, in the study by Cassie (1976), a random selection of schools were put on the S.G.I.S. system. Yet gains in career maturity attitude resulted from use of S.G.I.S. even when the system was not appropriately implemented as part of a comprehensive guidance program. Furthermore, these gains were scored by students randomly selected to make use of S.G.I.S.

Along with empirical evidence that S.G.I.S. positively affects the career maturity of secondary school students in grades nine, ten, and eleven (the three grades used in the study), the researchers in the present study are left with several important questions. What implementation procedures for S.G.I.S. would maximize gains in student career maturity? To what extent should use of the system be marketed? Should use of S.G.I.S. be prescribed (since students not requesting use of the system made significant gains in career maturity when asked to use S.G.I.S.)?

(b) Excerpts from an M.A. study by Donna Starr of the University of Calgary appear in Appendix III . From this case study, it would appear that use of the CHOICES system positively affects the career maturity attitude of students in grade twelve of a secondary school in Ottawa, Ontario.

While this study was limited to one school and to grade twelve students, the correlational data are indeed similar to findings in the Cassie (1976) study. What the study did not control for, however, is the potential interaction between pre-testing with the Career

Maturity Inventory (Crites, 1973) and use of CHOICES. Also, since only one secondary school was used, the findings cannot be generalized. Furthermore, since the researcher did not administer the complete Inventory, no conclusions about gains in career maturity competence (Knowledge of Self, Occupational Information, Goal Selection, Occupational Planning and Problem Solving) are reported.

General Conclusions

The studies by Cassie (1976) and Starr (1978) are included here as the only studies conducted to determine the effect of S.G.I.S. and CHOICES on the career maturity on secondary school students in Ontario. Apart from the limitations in both scope and design of the latter study, there does appear to be some justification for stating that both systems contribute to the career maturation process.

Cost Analysis

Attempting incorporate cost data into an evaluation can lead to many problems. Ragsdale (1979) describes some of the general difficulties associated with incorporating cost data. We present here a discussion of particular problems relevant to the present evaluation.

First of all, it is obvious that in their present forms, the CHOICES system is more expensive to implement than S.G.I.S. If a decision maker concluded that the two systems were equal in "benefits" or that S.G.I.S. was superior, the cost information would not complicate the decision process. If, on the other hand, the decision maker felt that CHOICES provided benefits greater than those provided by S.G.I.S., the decision process would require assignment of some dollar value to the benefits so that comparisons could be made along a single dimension.

There are at least two major problems associated with obtaining estimates for the purpose of making the comparison. The more obvious problem is that the dollar amounts for benefits will be arbitrary. The less obvious problem is that cost estimates for a system that has not been put into operation will also be surprisingly arbitrary. For example, the cost estimates can be altered by changing the assumptions about how many students should be served, how much time each student requires, how many students can be served by one terminal, how many hours per week the terminals will be used, etc. Therefore, there should be considerable doubt about the value of comparing the "costs" of SGIS and CHOICES with their respective benefits. In addition, the discussion that follows should strengthen this doubt.

Although there is some doubt about the wisdom of a cost/benefit comparison, let us assume, for the sake of our further discussion, that costs and benefits can be accurately estimated. If this assumption is correct, there are other compelling reasons why the comparison should not be made. One reason has to do with the effect of cost trends. The trends for personnel, materials, mechanical devices, and electronic devices costs are changing at different rates and the cost comparison between two systems will likely be altered over time if the systems are made up of different combinations of cost sources. More will be said about this topic, particularly the cost trends for electronic devices, in a later section of this document.

Even if we are able to adjust for the varying cost trends of the system components, there is another element that may negate the validity of the comparison, namely the context in which the systems will operate. What is meant by context may be best defined by some examples.

The Colleges of Applied Arts and Technology (CAATs) in Ontario offer one example of a special context. Many of the CAATs have computer terminals that are part of a computer-assisted instruction network connected to the DEC10 at Algonquin College and the Burroughs B6700 at Seneca College. The B6700 computer at Seneca is also capable of running, and in fact is running, the CHOICES system. Obviously, a decision about the use of CHOICES in the CAATs would be significantly affected by the context of this existing network.

Similarly, one must also be aware of the future context into which a system might be installed. The Ministry of Education in British Columbia has been investigating the feasibility of implementing a CHOICES network in that province. Although no official word is available about the study, it appears that the context of implementation is being given some emphasis. Thus, CHOICES could be considered as a part of a larger service offering many services over a large network, or CHOICES could be considered as a "stand alone" service, an initial network to which other services might later be added. Both of these contexts, the climate in which CHOICES might be implemented, have implications for the ultimate decisions regarding the use of CHOICES.

Finally, even if the assumptions equating benefits with costs are accepted, cost trends are estimated for all components of the systems, and the various possible future contexts for implementations have all been integrated with the cost estimates, there is at least one other strong reason why this comparison is not appropriate. Briefly stated, this last reason has to do with the time of development and selection of characteristics of the systems. CHOICES and S.G.I.S. are creations of their times and as such each has strengths and weaknesses which are not so much products of counselling philosophy as of available technology and its cost at that time.

A more general and perhaps more appropriate question to be asked is, "What are the necessary features (and desirable features) to be included in a guidance information system?" This question would be followed by, "How can these necessary and desirable functions best be provided n years from now (where n is a number which allows for implementation time)."

The first question requires a local (Ontario) answer based on the guidance needs of the Ontario schools, while the second question implies a more wide-ranging search before being answered. In particular, the B.C. Ministry of Education has done considerable analysis of methods for delivering information to students. In discussions with them it has been indicated that they are quite willing to share their findings and discuss the implications with the Ontario Ministry of Education.

Another step in answering the second question would be to compare the list of necessary and desirable functions with those functions provided by available systems. A system that had already demonstrated that it could provide all the necessary and desirable functions would certainly be preferred to a system still on the drawing board. If no system existed to satisfy all demands, the continuing search should include at least three considerations.

The first consideration is that of new and future technology. Future technology must be viewed with appropriate caution if it is not a direct extension of current technology (new developments such as magnetic-levitation transportation). Some developments manage to stay "just around the corner" - for example, the video-disc has been there for a decade or more.

Along with the consideration of new technology, there should be consideration of older, particularly non-computerized, alternatives. For example, edge-punched cards might be able to provide many of the interactive features offered by CHOICES if a satisfactory method of updating materials could be found.

If one of the old methods is not a satisfactory substitute, then multiple delivery methods should be considered. Microfiche is one possibility for the storage of large amounts of material in a small space. Updates of microfiche can be relatively inexpensive since computer files can be printed directly onto microfiche. Also, printed copies can be made from the images on microfiche. Other media should also be considered as delivery methods.

Trends in Electronics Prices

The continuing decline in the cost of electronic devices along with their increase in "power" is an amazing phenomenon. This has been most apparent in the case of electronic calculators, where the trend has been so rapid that some consumers are reluctant to buy a calculator at any time, knowing that in a short time they could get a more powerful one for the same price.

In the area of computers it has been observed over the past two decades that the amount of "computer power" that can be purchased for a dollar seems to double every two years. Doubling every two years means that in twenty years there is a thousandfold increase in power/dollar. A graphic illustration of this is the microprocessor, or computer on a chip. Microprocessors more powerful than the original multi-million dollar ENIAC of the early 1940s can now be purchased for less than ten dollars.

The trend does not hold for all levels of cost, since the effect of packaging is greater at the low end of the scale. Therefore, the cheapest calculator stays at about ten dollars, but its functions increase. There is a similar effect for small computers.

Price trends vary for electronics-based systems depending on the exact mix of component parts. A computerized guidance information system would have at least four major types of cost components: communications, terminals, programming and operations staff, and the computer system itself.

Communications costs have a substantial labor component and as a result the costs are relatively stable, although over the long term they are decreasing.

Computer terminals are of two basic types: those that print on paper (probably better for guidance systems) and those that use video screens. The printing terminals are more mechanical but have declined in price through the minimizing of mechanical parts. The video terminals have recently become cheaper than some printing terminals and the advantage will probably increase. Some video terminals have optional attachments for making printed copies of the screen contents. Some of the very basic video terminals are priced under $1000.

The cost trend for all staff costs is directly opposed to that of the electronics costs and is increasing steadily. As the demand for these skills increases, the rate of increase could be higher than that for wages in general.

The cost for the computer system itself is really a collection of different types of costs. Those subsystems with mechanical components, such as disk and tape drives and line printers, are declining in cost much more slowly, if at all, than the central processor and its memory. The latter two components involve no moving parts and have declined in price at a rate similar to that of pocket calculators. One report from Datamation (a trade magazine) says that IBM plans to market a computer with one-third the power of an IBM 370-168 (currently the University of Toronto's largest computer), 512 thousand bytes (characters) of main memory and 5 million bytes of disk memory, some time in the early 80's as a desk-top computer! Similarly, the scientists at the Los Alamos Scientific Laboratory, the first purchasers of the largest and most powerful computers, predict that in a few years the home hobbyist will be buying computers with the power of a Control Data 6400, one of the most powerful computers of the late 1960's.

Implications for a Computerized Guidance Information System

One major implication of these various trends is that a relatively small difference in the number of staff required to operate two large systems could become the major source of cost difference between the two systems. Therefore, the design or selection of a system must pay particular attention to the staff component.

Similarly for a centralized system, it is possible that the cost of communications, since they are declining more slowly than computing costs, could dwarf the cost of computing. Perhaps one should consider when the guidance system terminal will have the entire computer system in the terminal itself. Certainly, it appears that a lack of computing power will not prevent this from coming about.

In fact, one could probably design a reasonably inexpensive "stand alone" CHOICES system from current equipment if the bulk of the information files were stored on microfiche. Naturally, in designing such a system one would have to ensure that support personnel costs were kept to a minimum.

One of the factors that prevents our efficient use of new technology is our tendency to use the new technology in the same way that we used the old technology. Occasionally, it is useful to step back and re-think the entire problem, in terms of desired outcomes, before applying new techniques.

8 Conclusion

Summary of Conclusions and Implications

This study focussed on the quality and accuracy of the CHOICES data base; the effectiveness and efficiency of the on-line terminal; and a comparison of selected aspects of CHOICES and S.G.I.S. At the same time the study provided addiotional related information about the two computerized guidance systems. The major conclusions of the study are presented below.

1. The data bases of both CHOICES and S.G.I.S. were developed according to different assumptions. CHOICES begins with the student exploring his or her "self" and then relating the world of work to what the student knows or has learned about this "self." Consequently, the data base for this system contains considerably more person-related information than S.G.I.S. does. Since S.G.I.S. is basically an educational and career information service, it begins with information about educational institutions and specific careers. In one sense, S.G.I.S. compares poorly with CHOICES: it does not have the sophisticated programming or data base to provide person-related information in an interactive mode. On the other hand, CHOICES pales in comparison with S.G.I.S. in that the CHOICES system does not have an institutions file, and has "complete" information on a much more restricted range of careers (fewer than 700, in comparison with S.G.I.S.'s over 6000).

Since the data bases for each system respond to different assumptions, the reader must interpret the specific findings from this study accordingly. The fact remains, however, that print-outs from both CHOICES and S.G.I.S. contain a wide range of errors, omissions and irrelevancies. (The limitations of the two systems are discussed earlier in the report).

2. Judicious use of either CHOICES or S.G.I.S. will result in gains in student career maturity attitude. The researchers have included in this study excerpts from two related studies giving

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conclusive evidence that both computerized guidance systems expedite career maturity of secondary school students.

3. Neither CHOICES nor S.G.I.S. has been implemented according to a sound strategy for its effective use by students. Perhaps one of the weakest assumptions of a study such as this is that the two systems can be fairly evaluated. In addition, it is the judgment of the researchers that neither system has been effectively or fully implemented in schools. Thus, in the absence of clearly articulated procedures for introducing these systems to secondary schools, only fractional contributions to student career maturity are found. What may appear to be limitations of either of these computerized guidance systems may in fact be limitations within the programs established in schools for their effective use.

4. Counsellors appear to believe that students who use the CHOICES system require the assistance of the counsellor at all times. This finding contradicts the information about CHOICES that is disseminated by the system's support team. The additional cost of counsellor time spent in this student-computer interaction is considerable and must be addressed by those who estimate the feasibility of moving to the on-line system.

5. Neither CHOICES nor S.G.I.S. gives "immediate" feedback to students. Users of CHOICES typically wait from one to two weeks to use the system. Since only one student interacts with CHOICES at any given time, only six to ten students use the system in an average school day. Problems of scheduling, student absenteeism and system shut-down result in long waiting lists for use of CHOICES. In a very real sense, students "wait to find out." This point must be remembered in comparing the immediacy of feedback of on-line systems with the long turn-around time of "batch" systems.

6. Confidentiality is an important issue in the use of the on-line system. Since students can use CHOICES to find out about

or make estimates of their aptitudes and interests, the student-computer interaction must be looked at as a confidential encounter. Students using CHOICES for personal information expect to use the system in a private location, unhampered by an audience of peers or other "lookers-on."

7. There are sex and grade differences in the amount of use of both S.G.I.S. and CHIOCES. These differences may have important implications for deployment of guidance services.

8. The introduction of computer-assisted guidance systems requires a complete reappraisal of guidance-counsellor roles and responsibilities. Computerized guidance is synonomous with additional work for guidance counsellors. Guidance departments would be well advised not to continue personally delivering services for which the computer can be programmed. Otherwise, the addition of computer-assisted guidance services may mean additional work on top of an already demanding schedule.

9. Costing of computerized guidance systems is a immensely complex undertaking. For reasons cited within the report, the move from a batch to an on-line system requires considerable study. Continuing improvements in the systems themselves along with exponential decreases in the cost of sophisticated computer technology suggest that there may be wisdom in delaying the choice.

10. Counsellors believe they are inadequately prepared to make full use of both CHOICES and S.G.I.S. The one-week orientation to CHOICES was found to be inadequate for most counsellors. Upon returning to their school settings, counsellors required considerably more assistance in the introduction of the system to the school than was anticipated. Similarly, S.G.I.S. was made available to schools without sufficient back-up resources being provided to train counsellors in its most effective use with students.

11. Users of both systems want and expect close communication with the staff responsible for CHOICES AND S.G.I.S. As discussed in detail in this report, counsellors in schools want more interaction with officials from the Ministry of Education who have responsibility for S.G.I.S.

12. Both CHOICES and S.G.I.S. assume reasonably high levels of skill in reading. The career guidance specialists and counsellors in the schools have reason to question the suitability of the reading level of CHOICES and S.G.I.S. print-outs. Frequent use of jargon, technical language and complex sentence patterns render much of the information too difficult for many students to read.

13. Users of S.G.I.S. want and need interest and aptitude tests. The response to this component of CHOICES was very enthusiastic, particularly for senior students who appear to be attempting to consolidate plans for further education.

14. Student skill in decision making is absolutely essential to effective use of either S.G.I.S. or CHOICES. Each of these systems of computerized guidance assumes considerable skill in decision making. Few students are prepared to make judicious use of the information process or to take reasonable follow-up action after using these systems. The research team conclude that deficits in decision-making skill must be studied by the Ministry of Education. Computerized guidance services that purport to teach decision making are available.

15. Given the choice between a batch and an on-line computerized guidance service, students prefer the on-line system. Clearly, on-line systems offer a wider range of career guidance services. Moreover, on-line systems have the capability of enabling students to explore personal, educational and career information in an interactive mode. The major advantage is that students can make highly personal inquiries and then alter their exploratory tactics. Since

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CHOICES does not have an institutions file and offers a limited selection of careers, students at the time of the study were unprepared to use only CHOICES. It is recommended that the Ministry of Education vigorously implement use of S.G.I.S. Concurrently, the advantages of on-line systems must be given consideration for future use. The "ideal" computerized guidance service, completely within the limits of computer technology today (and possibly cost feasible in the early 1980's), would be an on-line system with extensive educational and career information; would have training routes for development of student skill in decision making; would provide opportunities for students to understand their values, abilities and interests; would relate person data to the world of work; would teach students strategies for relating occupations in the world of work to occupational clusters or career groups. Neither CHOICES nor S.G.I.S. is capable at this time of delivering all these services. Nevertheless, features of both systems, as described elsewhere in this report, could become important components of an "ideal" computerized guidance system.

Recommendations

Included here are a series of recommendations that follow naturally from the conclusions and implications of the study.

1. Procedures for appropriate implementation of computer-assisted career guidance must be developed. Counsellors involved in this study felt inadequately prepared to implement CHOICES and S.G.I.S. Many students do not know that their schools offer computer-assisted career guidance. Counsellors struggle with the new service without having selectively eliminated or scaled down activities which could reasonably be replaced by the computer service. Student use of the computer-assisted career guidance services is often much less productive than it could be.

2. S.G.I.S. should incorporate interest and aptitude tests into its data base. Students response to such tests, which are available from CHOICES, is enthusiastic. Also, this information may lead to increased self-awareness, a prerequisite of sound vocational planning.

3. Students should be taught decision-making skills before they use S.G.I.S. and CHOICES. An assumption inherent in the use of career, educational or self-information is the ability to make decisions about how you will use the information.

4. All print-out material from S.G.I.S. and CHOICES should be screened for outdated information, irrelevancies, unsuitable style, omissions, level of prescriptiveness, reading level, balance and general appeal. Analysis of the two data bases suggests that each system has strengths. It is also apparent, however, that each system requires immediate updating of its data base.

5. The visual display screen available with on-line S.G.I.S. should be considered as a positive feature of on-line systems. All students who used on-line processing with S.G.I.S. stated that use of the visual display screen was preferable to reading the computer print-out at the terminal.

6. Further study must be conducted to determine whether the counsellor or a counsellor assistant needs to sit with students who are using CHOICES. Both the level of interference and the cost factors associated with this practice should be considered. The CHOICES team affirm that their interactive guidance system does not require counsellor involvement to the extent observed in the study; but counsellors in the study did not agree that the system can "stand alone."

7. The move to interactive processing should be delayed for at least two years. Rapid changes in computer technology and the required further development of the CHOICES system are the primary reasons in support of this recommendation.

8. Further research is needed to determine the differences existing in career guidance needs of secondary school males and females. This research study has shown that there are sex and grade differences in the amount of use of the two computer-assisted guidance systems. Without a more thorough appreciation of such differences in career guidance needs, the delivery of career guidance is greatly hampered.

9. Strategies for reducing turn-around time for information from S.G.I.S. must be found. Some counsellor practices unnecessarily add as much as one week to the time elasped between student request for information and return of the print-out.

10. Opportunities to personalize S.G.I.S. print-outs should be explored. The constant reference in the CHOICES system to the student's name appears to heighten the student's interest in the exploration process.

11. The CHOICES data base should be increased to include "complete" information on more careers. Students continue to make requests for occupational information available from S.G.I.S. but not available on CHOICES.

12. S.G.I.S. should increase its data base to include additional career-related information. The many temperament factors available from CHOICES are important particularly to senior students who want relatively complete descriptions of careers.

13. On-line computerized guidance systems should be located in a private area of the guidance office or the school. Students expect to have privacy when making use of the interest and aptitude tests available on CHOICES. Other interactions with the CHOICES terminal may also be personal. Locating the terminal in the main thoroughfare of the guidance office violates a student's desire for privacy.

14. Further study should be conducted to discover ways in which more efficient use can be made of on-line systems. A school of

1,200 students, each with a critical need for career and educational information, quickly exhausts the capability of an on-line computerized guidance terminal. Immediacy of feedback, one of the central strengths of on-line processing, requires further attention. (When the system is in demand, students may wait two to three weeks for an appointment to use CHOICES.

15. Research should be conducted to determine cost-feasible interfacing of computer-assisted services with microfiche, and other conveniently stored and accessed materials. Much of the information stored in the CHOICES data file could be removed and placed on microfiche. The student could be directed by the computer to the appropriate microfiche. The expense for computer memory could thus be greatly reduced.

Appendix I
Student Questionnaire

STUDENT QUESTIONNAIRE

GRADE: (9 ___) (10 ___) (11 ___) (12 ___) (13 ___)

SEX: M ___ F ___

AGE: Years ___ Months ___

PROGRAM: Regular (4 year) ___ Advanced (5 year) ___

[illegible]ME: ....

INFORMATION

This questionnaire is designed to help us learn more about both CHOICES and SGIS. CHOICES is the name we use for the computer terminal in your school Guidance Office. CHOICES helps you learn more about yourself and about the world of work. When you use CHOICES, you sit down at the terminal in the Guidance Office and type in your name, answers to questions about your interests, aptitudes and vocations. CHOICES then gives you a typed computer print-out which you read as you continue to use this system. When you have finished your question and answer session at the CHOICES terminal, you take the computer print-out with you. CHOICES gives you information right away — once you give CHOICES the correct information, CHOICES gives you immediate feedback.

SGIS is a different system. SGIS does not have a computer terminal in your school Guidance Office. Rather, to use SGIS you fill in colour-coded computer cards. These cards are sent by mail to a computer. In about one week, you receive a computer print-out with the information you requested. You use SGIS to assist you in finding out about vocations. You can also get information about student loans, how to take job interviews, and so forth from SGIS.

These questions will assist us in learning more about your reactions to:

(1) CHOICES, the computer system with the terminal in your school (looks like a large typewriter).

(2) SGIS, the computer service that uses colour-coded computer cards and does not have the computer terminal in your school.

SECTION A

1. How many times have you used CHOICES?

   (Check One) 1___ 2___ 3___ 4___ 5___ 6___

2. How much time did you spend learning how to use the CHOICES terminal?

   (Check One) 0-15 min.___ 15-30 min.___ 30-45 min.___ 45-60 min.___

3. How did you first learn that your school had the CHOICES computer terminal?

	(Check One)
from a counsellor	________
from a teacher	________
from a friend	________
from a family member	________
from a school announcement	________
from a guidance bulletin	________
from a personal visit to the Guidance Office	________

4. Why did you first use CHOICES?

	(Check One)
I thought it would help me.	________
I was curious about it.	________
My counsellor or teacher recommended it.	________
Students in our class had to.	________
I'm not certain why.	________

5. Did you complete a worksheet before you used CHOICES?

   Yes ___ No ___

6. Did you have an interview with a counsellor to talk about CHOICES before you used the terminal?

   Yes ___ No ___

7. If you completed a worksheet before using CHOICES, did you find that:

(Check One)

The worksheet saved time at the terminal. ________

The worksheet was very confusing ________

The worksheet helped me explore my interests. ________

The worksheet did not assist with my use of the terminal. ________

8. How much time did you spend with the counsellor and in any group work preparing to use CHOICES.

(Check One) 15 minutes___ 30 minutes___ 60 minutes___

90 minutes___ more than 90 minutes___

9. How long did you wait between the time you first asked about CHOICES and you actually sat at the CHOICES terminal?

(Check One)

I used CHOICES the same day. ________

I waited several days. ________

I waited about a week. ________

I waited more than a week. ________

10. The reason I had to wait to use CHOICES was:

(Check Here)

Too many people wanted to use CHOICES. ________

I had to be trained to use it. ________

I missed my appointment. ________

The CHOICES terminal was out of order. ________

11. While I was at the CHOICES terminal:

(Check One)

I was by myself. ________

I had a counsellor with me. ________

A guidance assistant was with me. ________

I had a counsellor or assistant only when I needed help. ________

12. I would prefer to have the CHOICES terminal:

(Check One)

in the reception area of the guidance office ________

in a private office in the guidance centre ________

I really don't have a preference ________

13. When I was at the CHOICES terminal, I found that my questions were answered:

(Check One)

too slow ________

too fast ________

about the right speed ________

14. I found the words and sentences used in the CHOICES printout:

(Check Here)

hard to understand ________

easy to understand ________

interesting to read ________

15. What did you do with your computer printout from CHOICES?

(Check Here)

shared it with a friend ________
shared it with a parent/guardian ________
shared it with a counsellor ________
shared it with a teacher ________
threw it away ________
studied it by myself ________

16. I found the CHOICES terminal:

(Check One)

very confusing at first ________
easy to use ________
very confusing ________

17. Most of my time at the terminal was spent:

(Check One)

figuring out how it worked ________
making mistakes and correcting them ________
getting helpful information from CHOICES ________
talking with the counsellor or assistant ________

18. I used the CHOICES terminal to:

(Check Here)

Get specific information about occupations ________
Compare different occupations ________
Study related occupations ________
Study my occupational interests (what I like) ________
Study my occupational aptitudes (what I do well at) ________
See what the CHOICES terminal was like ________
Explore Occupations ________

19. I would learn more from CHOICES if:

(Check Here)

I knew more about using the CHOICES terminal ________
I used the CHOICES terminal more often ________
I spent more time when at the terminal ________
I could use the CHOICES terminal by myself ________
I had more counsellor assistance ________

20. If the CHOICES terminal were always available in my school, I would use it:

(Check One)

Never ________
Once a year ________
Twice a year ________
Three to four times a year ________
More than five times a year ________

21. Would you recommend the CHOICES terminal to students in your class:

Yes ___ No ___ I don't know ___

22. I think that CHOICES is:

____
____
____
____
____
____
____
____
____

PART B

Complete Part B only if you have used SGIS!

1. How often have you filled in the colour-coded computer cards to get information from SGIS?

(Check One)

1 time ________
2 - 3 times ________
4 - 5 times ________
6 or more times ________

2. How did you first learn your school had the SGIS service?

(Check One)

from a counsellor ________
from a teacher ________
from a friend ________
from a brother or sister ________
from a school announcement ________
from a guidance bulletin ________
from a personal visit to Guidance Office ________

3. How did you learn to use SGIS?

(Check One)

I figured it out myself ________
The Guidance Secretary showed me ________
A friend explained it to me ________
A counsellor explained it to me ________

4. I found the SGIS system

(Check One)

difficult to understand ________
easy to use ________

5. What did you do with your computer printout from SGIS?

	(Check Here)
I shared it with a friend	
I shared it with a parent/guardian	
I shared it with my counsellor	
I shared it with a teacher	
I gave it to a friend	
I discarded it (threw it away)	

6. I used the SGIS system to:

	(Check Here)
Find out about occupations	
Find out about student loans	
Find out about taking job interviews	
Find out about my interests	
Find out about trade schools, college, university	

7. I would use the SGIS system more often if:

	(Check Here)
I had more assistance from my counsellor	
I received my computer printout sooner	
I knew more about how SGIS works	
I didn't have CHOICES	

8. After filling in computer cards for SGIS, I usually had to wait for my computer printout:

	(Check One)
less than a week	
about a week	
about two weeks	
more than two weeks	

9. The printout from SGIS was:

(Check Here)

easy to understand ________
difficult to understand ________
enjoyable to read ________

10. If SGIS is available in your school, how often do you plan to use it each year:

(Check One)

1 time ________
2 - 3 times ________
4 - 5 times ________
6 or more times ________

11. Would you recommend SGIS to students in your class:

Yes ___ No ___ I Don't Know ___

12. If my school had only CHOICES or only SGIS, I would prefer to use;

CHOICES ___ SGIS ___ Can't Decide Which ___

13. If my school had both CHOICES and SGIS, I would prefer to use:

(Check One)

Both CHOICES and SGIS ________
Only CHOICES ________
Only SGIS ________
I don't know ________

14. I think that SGIS is:

____

____

____

____

____

Appendix II

Effects of a Computer-Assisted Career Information Service on the Career Maturity of Ontario Students

By James Robert Bruce Cassie

ABSTRACT

This study was designed to assess the effects of the Ontario Ministry of Education Student Guidance Information Service (S.G.I.S.) on student career maturity. S.G.I.S. is a computer-assisted, indirect-inquiry system for delivery of vocational, educational and career-related information.

From a random selection of six Ontario Secondary Schools, within each school sixty grade nine, ten and eleven subjects were randomly selected and assigned on the basis of sex and grade to treatment and control groups. The researcher wished to determine the User Group gains in career maturity and the extent to which gains were modified by testing, school, sex and grade.

Subjects in four schools were Pre- and Post-tested with the Career Maturity Inventory (CMI). In addition, subjects in two schools were Post-tested only with the CMI. The CMI describes two career maturity dimensions: Attitude and Competence. The Competence Test consists of five sub-tests measuring: Knowledge of Self, Occupational Information, Goal Selection, Occupational Planning and Problem Solving.

Analysis of Covariance was conducted to study the relationship between Users and Non-Users of S.G.I.S. and performance on the CMI. A Multivariate Analysis of Variance was performed to study the relationship between the CMI results for the Post-Only and the Pre-Post Users and Non-Users.

Excerpts from a dissertation submitted to the Faculty of the Graduate School of State University of New York at Buffalo in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Results indicate that short-term use of S.G.I.S. increases career maturity attitude. Also, S.G.I.S. interacts with grade, sex, and school such that there are differential gains in Knowledge of Self, Occupational Information, Goal Selection and Occupational Planning. In conclusion, even for students not requesting assistance from S.G.I.S., prescribed use of the system can result in significant gains in career maturity.

CONCLUSIONS AND IMPLICATIONS

Since the early 1970's, the S.G.I.S. has been vigorously marketed in Senior Elementary and Secondary Schools in Ontario. In response to the desire of career guidance personnel to facilitate the delivery of guidance services, schools have latched on to this computer-assisted service with considerable expectation and anticipation. The stated goals of S.G.I.S. appear to respond to the best objectives of career educators. Yet, within the haste with which the service was implemented, one can only speculate about how S.G.I.S. can make a difference to the career maturity of students. The present study was conducted to assess the effects of S.G.I.S. on the career maturity of students in grades nine, ten and eleven.

The findings of this research suggest that S.G.I.S. does expedite the career maturity attitude of students. Furthermore, the system results in increased Knowledge of Self, Occupational Information, Goal Selection and Occupational Planning. One should note, nevertheless, that the latter contributions of the system are dependent upon the students' sex, school and grade. Thus, while most students learn more about themselves and about occupational information, for instance, some do not benefit in this manner from use of the system.

Table 26 describes the variables represented by career maturity attitude.

TABLE 26

VARIABLES IN THE ATTITUDE SCALE OF THE CMI

Dimension	Definition	Sample Item
Involvement in the choice process	Extent to which individual is actively participating in the process of making a choice	"I seldom think about the job I want to enter."
Orientation toward work	Extent to which individual is task- or pleasure-oriented in his attitudes toward work and the values he places upon work	"Work is dull and unpleasant." and "Work is worthwhile mainly because it lets you buy the things you want."
Independence in decision making	Extent to which individual relies on others in the choice of an occupation	"I plan to follow the line of work my parents suggest."
Preference for career choice factors	Extent to which individual bases his choice upon a particular factor	"Whether you are interested in a job is not as important as whether you can do the work."
Conceptions of the choice process	Extent to which individual has accurate or inaccurate conceptions about making a career choice	"A person can do any kind of work he wants as long as he tries hard."

The *Administrator's Manual* reports the *Attitude Scale* is associated with the elicitation of feelings, the subjective reactions, the dispositions the individuals has toward making a career choice and entering the world of work. The suggestion is, then, that Users of S.G.I.S. become better disposed to work, more involved in the process of career choice and career decision making.

Bartlett (1968, p.107) found that high scorers on the *CMI-Attitude Scale* are "more assertive, persistent, goal-oriented, forceful, and independent."

The *Attitude Scale* (Crites, 1974) yields a raw score representing "how much progress has been made along the continuum of career development in adolescent... relatively higher scores indicate greater similarity to responses of the twelfth grade standardization sample." Performance on the *Attitude Scale* can be looked at in terms of "degree" as explained in the preceding quotation, or "rate", derived from a student's percentile rank with reference to others at the same grade level. Thus, the gain score of 1.7 points on the 50-point scale could represent a percentile jump from 59th percentile to 73rd percentile for grade ten Users who averaged 36 on the Pre-test.

Yet, it is unfortunate that the *Attitude Scale* does not reduce to sub-scores. Crites reports "it was constructed to be a composite of several clusters of vocational attitudes" (Crites, 1971, p.42). While the *Scale* does give a global measure of conative gains, thus demonstrating that S.G.I.S. makes a positive difference to Users, such a global measure eludes further analysis. For instance, which of the dimensions of career maturity attitude illustrated in Table 26 is most affected by use of S.G.I.S.? Moreover, an item analysis cannot readily portion the variance because many of the items appear to cross dimensions. The item "I keep changing my occupational choice" could suggest "Independence in decision making" since it is "I" who am deciding to change "my" choice. This item might suggest "Involvement in the choice process" since the person is "actively participating". On the other hand, this item may relate that the individual has the "conception" that "the choice process" is so flexible that frequent occupational shifts are realistic. The point is, the Attitude Scale is, indeed, a global measure.

Fortunately, the Competence Test does reduce to particular sub-tests. Because there are five specific sub-test scores, the total score has not been used for the data analyses. Crites (1974) has suggested "a total score for the five parts of the Competence Test would tend to obscure specific immature career behaviours which the various parts are designed to reveal" (p. 28). Also, there are no norms for total Competence scores since these would not contribute information beyond what is learned from specific sub-scores.

There are no main effects resulting from use of S.G.I.S. on performance on Competence sub-tests. Nevertheless, the interactions between S.G.I.S. and sex, grade and school for the sub-tests are very instructive. These interactions with S.G.I.S. are found in performance on Knowledge of Self, Occupational Information, Goal Selection and Occupational Planning sub-tests (See Chapter 4, Summary).

Regarding sex differences, these data tend to support the findings of Smith and Herr (1972, p. 181) who found that girls in the eighth and tenth grades appeared to be slightly more mature. Thus, it is not surprising that relative to some sub-tests females will have higher performance. This apparent maturational edge the girls have over their male counterparts is also likely to assist them in their productive use of S.G.I.S. - delivered material. For the Knowledge of Self sub-test, females as a group consistently outperform males as a group. An unanswered question, however, is "Why do female Non-Users outperform female Users relative to Knowledge of Self gain scores?" Although the differences between User and Non-User gains are very slight for the female groups, the researcher posits that exposure to S.G.I.S. delivered material confronts the subject with new possibilities regarding career, educational and career-related options. Until this information is assimilated with "self" there may be a momentary move toward less certainty about "self" knowledge, hopefully resulting in a greater knowledge of self at some point in the future. Certainly, this suggestion is speculation. Yet the consistency with which both User and Non-User females gain in Knowledge of Self, with the Users gaining less quickly, may well support this interpretation.

The fact that females generally outperform males and that User females made higher gains than User males is shown in Table 27. These results suggest that the generally higher maturation level of the females results in more productive interaction with the new experience offered by S.G.I.S. Furthermore, the burgeoning curricula for female awareness may have created higher levels of expectation and motivation among female Users. Kaper and Lotowytev (1972) found

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an interaction between curriculum and sex affecting occupational values.

TABLE 27

PRE- AND POST-TEST MEANS ON THE CAREER MATURITY INVENTORY SUB-TESTS FOR USER AND NON-USER MALE AND FEMALE GROUPS

		User		Non-User	
	Subtest	Males	Females	Males	Females
Pre-test	Attitude	34.52	35.63	35.23	36.11
	Knowledge of Self	13.59	14.71	13.12	14.36
	Occupational Information	16.17	16.17	15.12	16.43
	Goal Selection	14.43	13.87	13.84	13.55
	Planning	13.67	13.87	12.88	14.05
	Problem Solving	11.50	12.27	11.16	12.75
Post-test	Attitude	35.39	37.74	34.35	36.30
	Knowledge of Self	13.78	15.17	12.20	14.85
	Occupational Information	16.72	16.87	15.51	16.84
	Goal Selection	14.37	14.48	13.14	14.68
	Planning	13.85	14.52	13.33	14.18
	Problem Solving	11.30	12.83	10.82	12.98

The S.G.I.S. - school interactions suggest that the use of S.G.I.S. differs from school to school. For example, performance on the Goal Selection sub-test is dependent upon what school the subject attends. Users in some schools score greater gains than Non-Users. But, there are some schools in which Non-Users do as well as, or better than Users. The interface between S.G.I.S. and the school learning environment is different from school to school. Baldwin (1967), Langer (1969), and Harris (1974) have written about the possible interaction of maturational potential and the environment as relevant evocative stimuli. Perhaps the most forceful statement about how schools might discharge their responsibility to further career maturation is presented by Herr (1972) who would have the entire system of education "unified" around career development. Similarly, Omvig, Tullock and Thomas (1975, p. 266) found that students' career maturity levels as measured by the CMI, were affected by the career education program. Furthermore, Herr and Enderlein (1976, p. 238) have concluded that school, grade, curriculum and sex make a difference:

> This study has illustrated that while vocational maturity, as measured by scores on the Career Maturity Inventory, does proceed monotonically (incrementally) by grade level, this is an over-simplified explanation of the process. School effects, curriculum effects and sex differences also influence the rate and level of vocational maturity which occurs... It is clear that vocational maturity, a central criterion of vocational education, is modifiable and that treatment effects (curricula differences in this instance) can advance this process.

The S.G.I.S. - school interation breaks down further to the manner in which S.G.I.S. interacts with grades within particular schools. In this instance too, the totality of experiences geared by a school system for students in a particular grade can result in differential responses to a computer-assisted guidance service. For instance, in most schools the grade nine and eleven User students had larger gains in Occupational Planning performance than the respective Non-Users. Yet in some schools the Non-User grade ten group outperformed the Users. It would seem, then, that the manner in which a school dispenses its services across grades and sexes determines how these factors will interact with the addition of a new service to the school. These data suggest that one's sex, grade and school can interact with the use of S.G.I.S. to produce either gains or losses in career maturity competencies.

An additional finding of this study is that even for students who did not choose S.G.I.S., statistically significant (and sometimes practically significant) gains were scored from "recommended" use. The computer requests were pre-selected and sequenced; students responded to a prescribed agenda. Even so, career maturity attitude scores increased. This increase is particularly interesting in light of the short-term use of S.G.I.S. The fact that the User group means increased an average of 1.7 points on a 50-point scale beyond the Non-User increases deserves our attention. These gains could be much greater over a longer engagement with the system. Furthermore, had the school systems adapted guidance curricula to S.G.I.S. and had students' motivation for use of S.G.I.S. been increased, a reasonable prediction seems to be that still further gains would result. In this study, the researcher "invited" students to use the service but according to a pre-determined format. Within this "prescribed" agenda, students were free to respond to their "immediate needs".

Since students generally were able to improve their career maturity attitude performance because of S.G.I.S. use, the career educator is left with a decision. Should use of S.G.I.S. be a curricular requirement, a guidance service available to interested students, or a part of a career education program that is vigorously "marketed" throughout the entire school? Clearly, a reasoned position might be a rapprochement of student expressed interests and a comprehensive career education program. Such a program would result in increased motivation toward career decision making. Students would explore themselves and learn how their interests and aptitudes interact with their value systems to pre-dispose them toward certain choices. They would learn how to search for information and how to use it. Decision models would be taught. In vivo simulation, role playing and actual experiences in the world of work would follow. S.G.I.S. as a fruitful source of occupational, educational and career-related information would play a significant role within the over-all career education program. For the career educator to realize maximum career maturation of students, (s)he must have a comprehensive awareness of the career education macrocosm with which the Student Guidance Information Service will interface.

Nevertheless, the preceding suggestions are made within a general presumption that S.G.I.S. will continue to exist as a service to Ontario Secondary School. Unfortunately Harris and Tiedeman (1974) report that the long-range success rates of such systems are not good. Of approximately fifteen indirect-inquiry systems that were in operation throughout the United States, only one remains. Computer systems that survive, report the authors, are:

> (a) direct-inquiry systems;
>
> (b) directed to school populations at the secondary levels;
>
> (c) cost feasible;
>
> (d) use standard terminal equipment; and
>
> (e) specialize in providing information retrieval, sorting, and sysnthesis for the purpose of career decision making... (p. 7).

Obviously, S.G.I.S. is not a Direct-Inquiry System. Yet, it does conform to the remaining criteria suggested above. In addition, having been subjected to rigorous experimental procedures, and a comprehensive career maturity assessment, S.G.I.S. has been shown to make a positive difference to students in grades nine, ten and eleven in Ontario Secondary Schools.

The reasons S.G.I.S. should continue in operation are clear. Its use results in expedited career maturity. That the system has not been "sacked" by austerity measures, like so many of its companion systems in the United States, is a credit to the Ontario Ministry of Education. Harris and Tiedeman (1974) note that few commercially marketed Indirect-Inquiry Systems are now operating. S.G.I.S., continues to expand, however, because it is funded by the Ministry of Education as an important educational service. S.G.I.S. is not expected to generate financial profits for a commercial enterprise. Moreover, because of the Ministry's responsibility for education in the Province, S.G.I.S. readily adapts its data storage and retrieval to the latest information available. The system is both comprehensive and current in its delivery of educational, occupational and career-related material.

However, most schools appear to purchase S.G.I.S. services only for senior students. This allocation of guidance funds is typically justified by counsellors as a necessary response to the impending decisions faced by seniors. The belief that career maturation is a process (See Chapter 2: Theories of Career Development) and the support of this research suggest that students in grades nine, ten and eleven can increase their career maturity through use of S.G.I.S. To a large degree, the success of decisions in senior years of secondary school is dependent upon the successful encounter with prior decisions. S.G.I.S. can play a part in this process of engagement with decisions along a continuum from simple to complex judgments. Equipped with an arsenal of accurate information about educational, occupational and career-related matters, the student is better prepared to weigh alternatives, evaluate directions and formulate tentative goals. One would be remiss if he suggested that receiving information is synonomous with taking action. The important factor, however, is that sound career decisions require relevant, accurate information.

IMPLICATIONS FOR FURTHER RESEARCH

This research has explicated several career maturity facets

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that are expedited by the use of S.G.I.S. Analysis of these findings suggests that there are a number of related research projects that need also to be conducted.

S.G.I.S. at the present time has three distinct services: mail-in batch service (as in this study), board-office batch service, and in-school monitoring. That is, the first two services are indirect and the last is a direct service. Research could be conducted to measure the differential effects of each service on the delivery of career education.

Similarly, research could study the effects of short and long feedback times. Naturally, more distant parts of the province experience longer turn-around for computer request forms. Student reactions to unavoidable delayed turn-around, suggest this research topic is important.

Additionally, observation of several significant interactions in this study demonstrates that in some schools and for some males, S.G.I.S. interacts such that Post-test performance is lowered. Research is required to study this reverse direction of intended growth. While considerable discussion has been accorded growth in certain career maturity areas, the tendency for some subjects to perform less well on some sub-tests after use of S.G.I.S. is an interesting puzzle.

Studies could determine the relationships between traditional career education programs and computer-assisted guidance. Several interactions from this study suggest the possibility that use of S.G.I.S. can interact with existing career education to increase career maturity gains in certain areas. The most effective interface has yet to be discovered.

Several counselors have hinted to the researcher that S.G.I.S. changed the nature of student requests. Also, it was suggested by one counselor that some students attributed greater authority to his role because of the "credibility" of the "new" service. These ancillary, yet interesting responses to computerization require further study.

At its present stage of development, S.G.I.S. does not offer information about the user himself which can be matched with data about educational and vocational options. The user is responsible for knowing this information about self and then relating self to educational, vocational and occupational information. Studies could determine the increase in effectiveness derived from the addition of personal data to the feedback. Several Direct - Inquiry Systems with monitoring provide information about self. Researchers seem unanimous in their conviction that one who understands his "self" can better respond to "career". Kroll (1970) has written "the value of occupational information in self-evaluation and vocational success has long had empirical validation" (p. 230).

Moreover, this study looked at short-term use of a computer-assisted career education system. These findings support short-term use of S.G.I.S. as a vehicle for expediting career maturity. Nevertheless, the long-term effects of the system must also be determined. Are the gains retained over time. Would gains continue a linear increase over time? Questions such as these remain as challenges to future researchers.

Finally, one should note that subjects in this study did not select S.G.I.S. These students were randomly selected. In addition, students did not have completely free access to computer requests. Requests were scheduled according to a definite time sequence and a content order. Would higher motivation have been maintained had students used S.G.I.S. by personal choice and according to personal preference for requests? It is interesting to note that students in this research who used S.G.I.S. had significant increases in some career maturity scores even though they were not given a free hand in determining the career education needs the computer would service.

In conclusion, the researcher found a dearth of empirical data relating to the computerization of career education. As a general area of research, the field is ripe. Computer-assisted services come into and out of existence without having been adequately assessed. There appears to be little rationale for the discontinuation of many systems, other than the ever-present economic axe. With the availability of modern instruments to measure student growth, other systems must be evaluated. Otherwise the potential store-house of knowledge will respond too slowly to meet the demands encountered by the career guidance specialist.

Appendix III
Excerpts from a Draft Copy of an M.A. Thesis

By Donna Starr

CHAPTER 4

RESULTS

Univariate F ratios for the interaction of the two factors, experimental control and pretest - posttest are shown in Table 1. The means of the experimental and control groups for pretest and posttest scores are shown in Table 2 and Figure 2 (a, b, c).

Hypothesis I

The univariate F ratio for the interaction was significant at the .05 level. Group mean scores also show that the experimental group made gains over the control group. Thus, the null hypothesis was rejected suggesting that the CHOICES program did effect significant improvement in the level of the treated students' career maturity.

Hypothesis II

The univariate F ratio for the interaction between treatment and streaming (university bound (A) - non-university bound (G)) considering scores on the CMI Attitude Scale was not significant at a .05 level. Thus, the null hypothesis was accepted suggesting that there was no relationship between treatment and streaming.

Hypothesis III

The univariate F ratio for the interaction of treatment and sex (M or F) considering scores on the CMI Attitude scale was not significant at the .05 level. Thus, the null hypothesis was accepted suggesting that there was no relationship between treatment and sex.

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TABLE 1

Analysis of Variance Results for the Interaction of Experimental - Control With Pretest - Posttest

Univariate Test of Effects

Hypothesis	df	Univariate F	P less than
Treatment I	1,121	9.9150	.0021*
Stream II	1,121	.7333	.3936*
Sex III	1,121	.0895	.7654*

*P 0.05

TABLE 2

Experimental and Control Group Means and Standard Deviation for Pretest-Posttest Scores on Each Factor

	Factor		Pretest X	Posttest X
I	Treatment (CHOICES)		37.52	38.69
	Control		36.47	36.39
II	Streaming in Treatment (CHOICES)			
	Academic	CHOICES	39.42	40.55
		Control	37.94	38.15
	General	CHOICES	35.56	36.78
		Control	34.80	34.40
III	Sex in Treatment			
	Male	CHOICES	36.52	37.88
		Control	35.70	35.70
	Female	CHOICES	38.56	39.53
		Control	37.29	37.13

FIGURE 2a

Effect Due to Interaction of
Experiment - Control With
Pretest - Posttest for Each Factor (I)

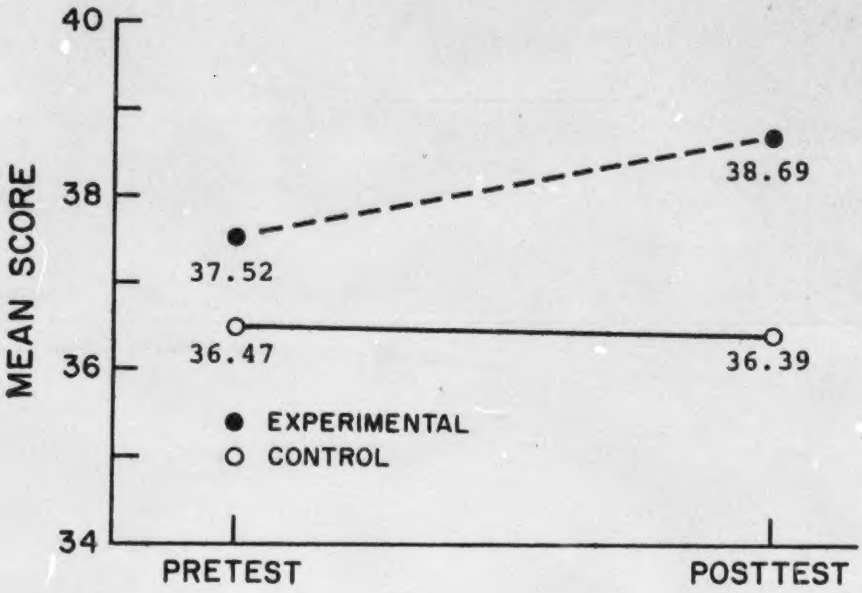

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FIGURE 2b

Streaming Treatment Pretest Posttest
Factor II

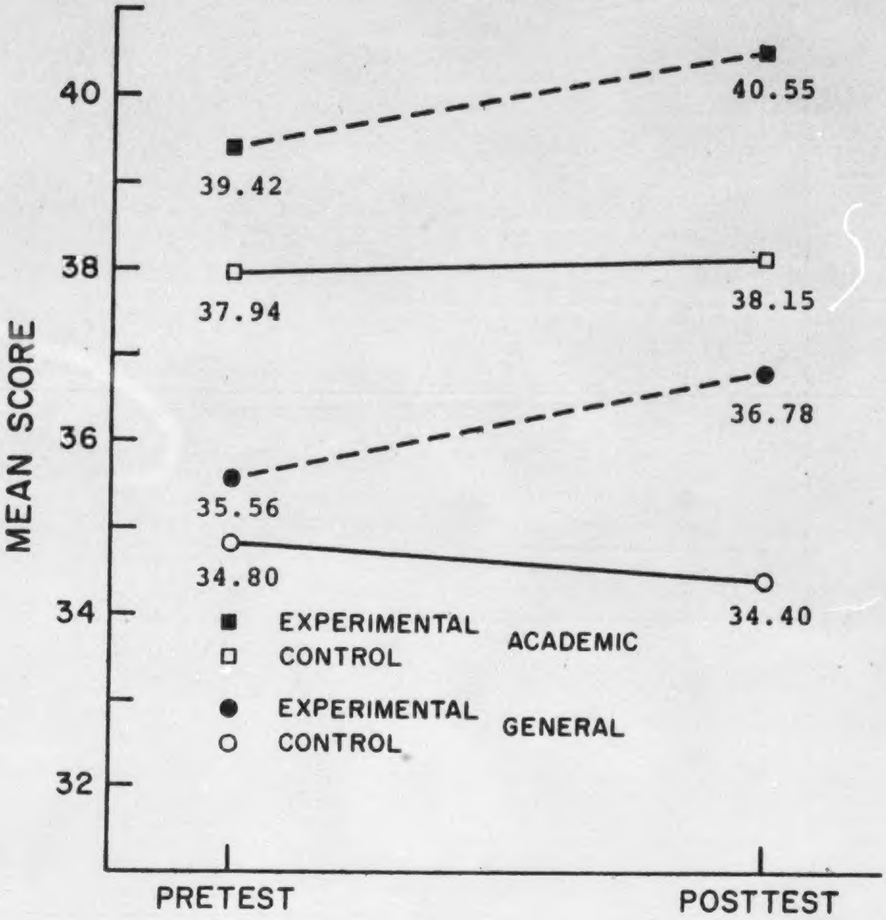

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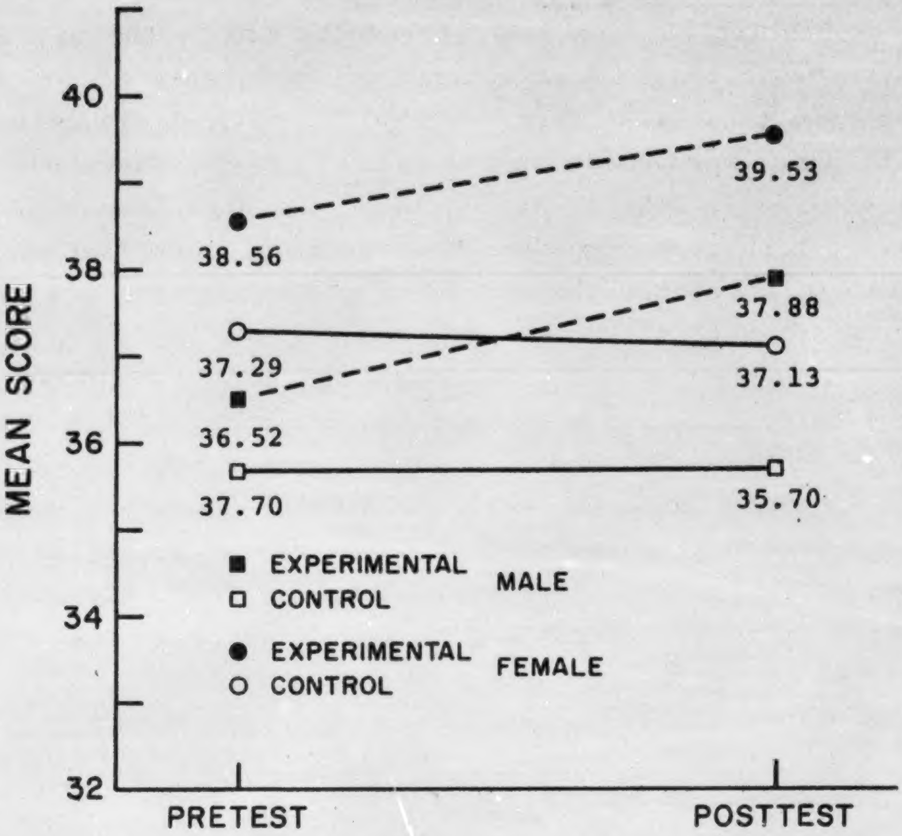
FIGURE 2c

Sex Treatment Pretest Posttest
Factor III



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CHAPTER 5

DISCUSSION

Summary and Discussion of Results

Statistical analysis of results led to the rejection of Hypothesis I and an acceptance of Hypothesis II and III. These results suggest that the CHOICES program did effect significant improvement in the career maturity attitudes of grade 12 Sir John A. Macdonald Senior High School students. However, both groups gained as a result of the treatment CHOICES with neither the streaming groups nor the sex groups gaining significantly over each other.

In agreement with this finding are the findings of the three-week study by Pyle and Stripling (1967) which also found that with use of a direct enquiry system (SIGI) gains in career maturity were shown by 66 Santa Fe Community College students. These students were given counsellor aid in orienting them to the system. The fact that "the career maturity attitudes were changed significantly in the relatively short period of three weeks" is additional evidence of the potential of systems such as SIGI or CHOICES.

Divine 1974, did not find a significant gain in career maturity of 84 college students who over a three-month period were exposed to SIGI, a direct enquiry computer program similar to CHOICES. It is interesting to note that his community students participated in SIGI without the aid of a counsellor or the Counsellors Handbook.

This study's findings that significant changes in career maturity attitudes did take place is supported also by earlier findings of Katz (1975), Pilato and Meyers (1973) and Melhus, Hershenson and Vermillion (1973).

The findings of this study that significant changes in career choice attitudes did not take place between university bound and nonuniversity bound students supports earlier findings by Melhus, Hershenson and Vermillion who agree with the major finding of this study, but who reported that academic students similar to university bound students did show significant gains in career maturity attitudes over general students similar to the non-university bound students in this study.

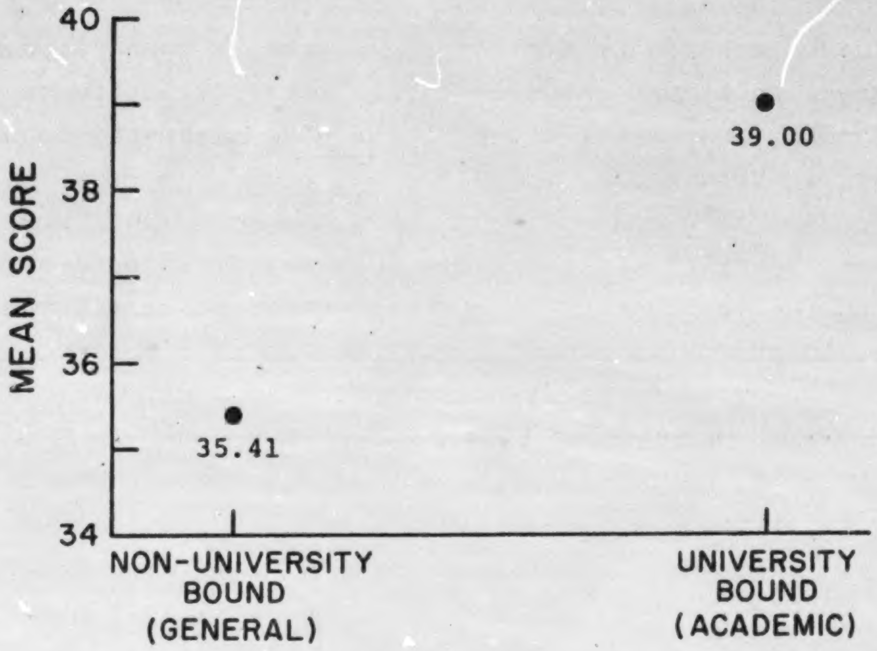
The findings of this study that significant changes in career maturity attitudes did not take place between male and female students is not substantiated or refuted by any other studies since no research on this phenomenon has been reported using direct computer systems.

It is interesting to note that there was a significant difference in the levels of career maturity attitudes between the university bound (academic) and non-university bound (general) students. The academic students scored significantly higher on the CMI than the general students (see Figure 3). This finding agrees with that of Crites (1969) where he found that vocationally oriented students were less mature on the CMI than their academically oriented counterparts. However, both groups gained as a result of the treatment CHOICES with neither group gaining significantly more than the other.

It should also be noted that the mean for this group of grade 12 students, 37.201, is comparatively similar (37.23) to that reported by Crites (1973b) for the 2,258 students in his sample from 6 different states. It is also similar to that (37.26) reported by Herr and Enderlein (1970). The fact that significant gains in career maturity attitude were found, given that their career maturity attitudinal

FIGURE 3

Observed Combined Means



level was as expected, gives even more credence to the fact that CHOICES can affect the career awareness of grade 12 students.

The open-ended statement "When I think of the word career, the first four things that come to mind are" was analyzed as to treatment group versus control group. The internal divisions of male versus female, academic versus general were not analyzed since significant differences were not found within these areas in the main study.

To evaluate the answers to the open-ended statement a value of 4 points was assigned to the first answer written, 3 points for the second answer written, 2 points for the third answer, and 1 point for the final answer. No penalty was assigned if the student did not complete all four requested answers.

It is interesting to note the following pertinent differences between the answers given by the treatment group versus the control group in pre- and posttesting (Figures 4a, 4b): the treatment group concentrated less on references to specific positions (i.e. cook, lawyer, roofer) in their posttests than did the control group; the posttest scores of the treatment group seemed to indicate that they were more aware that a lifetime position might not be realistic today; the control group in both their pretest and posttest mentioned the challenge of a career (a point difficult to explain).

It is most interesting to note that the treatment group's post-statement answers varied to a much greater degree than those of the control group. Figure 4c shows the increased response in areas such as interests, goal setting, hard work, working hours, environmental conditions and stress. Although these aspects of a career are focussed

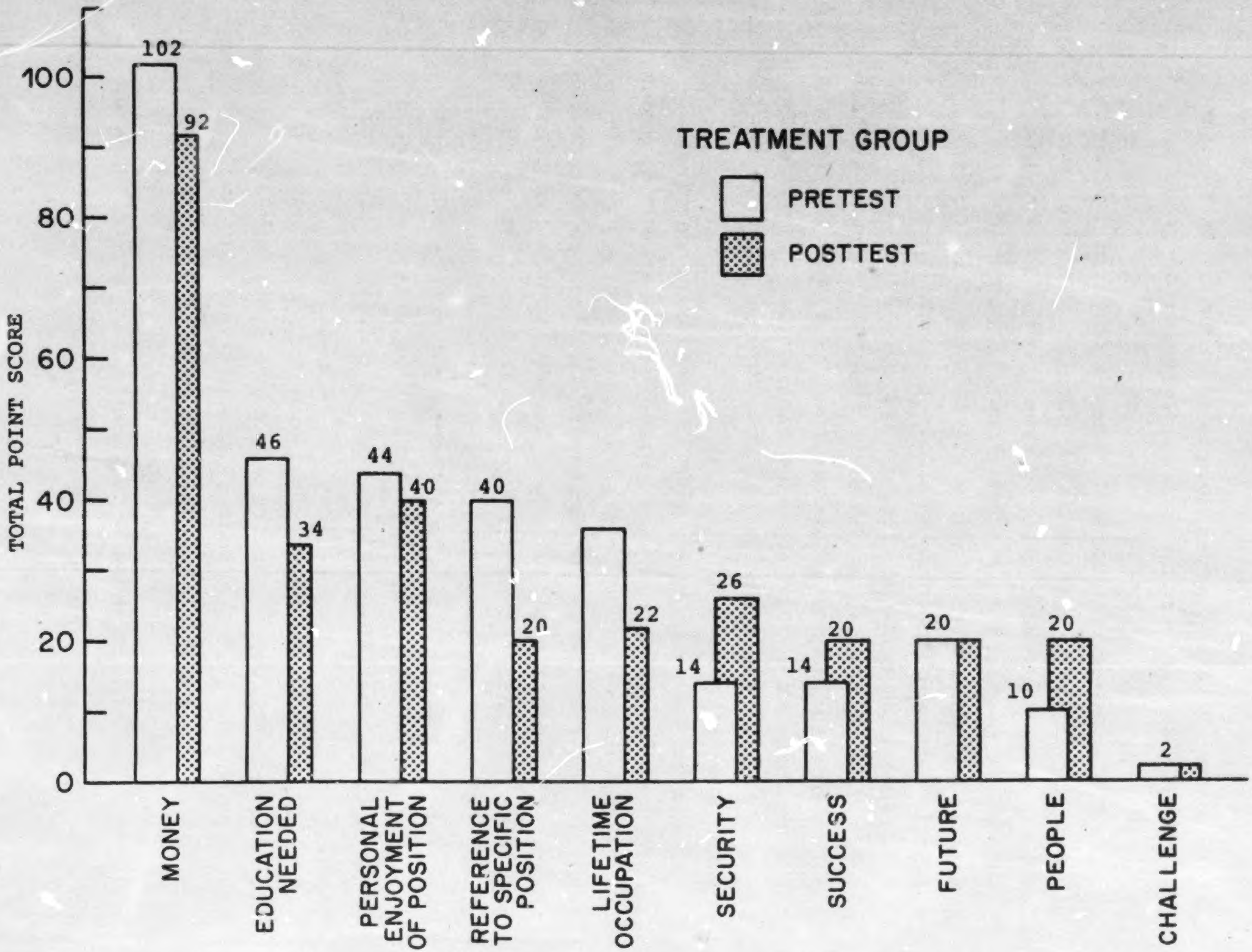


FIGURE 4a Pretest & Posttest Open-ended Statement Results - Treatment Group

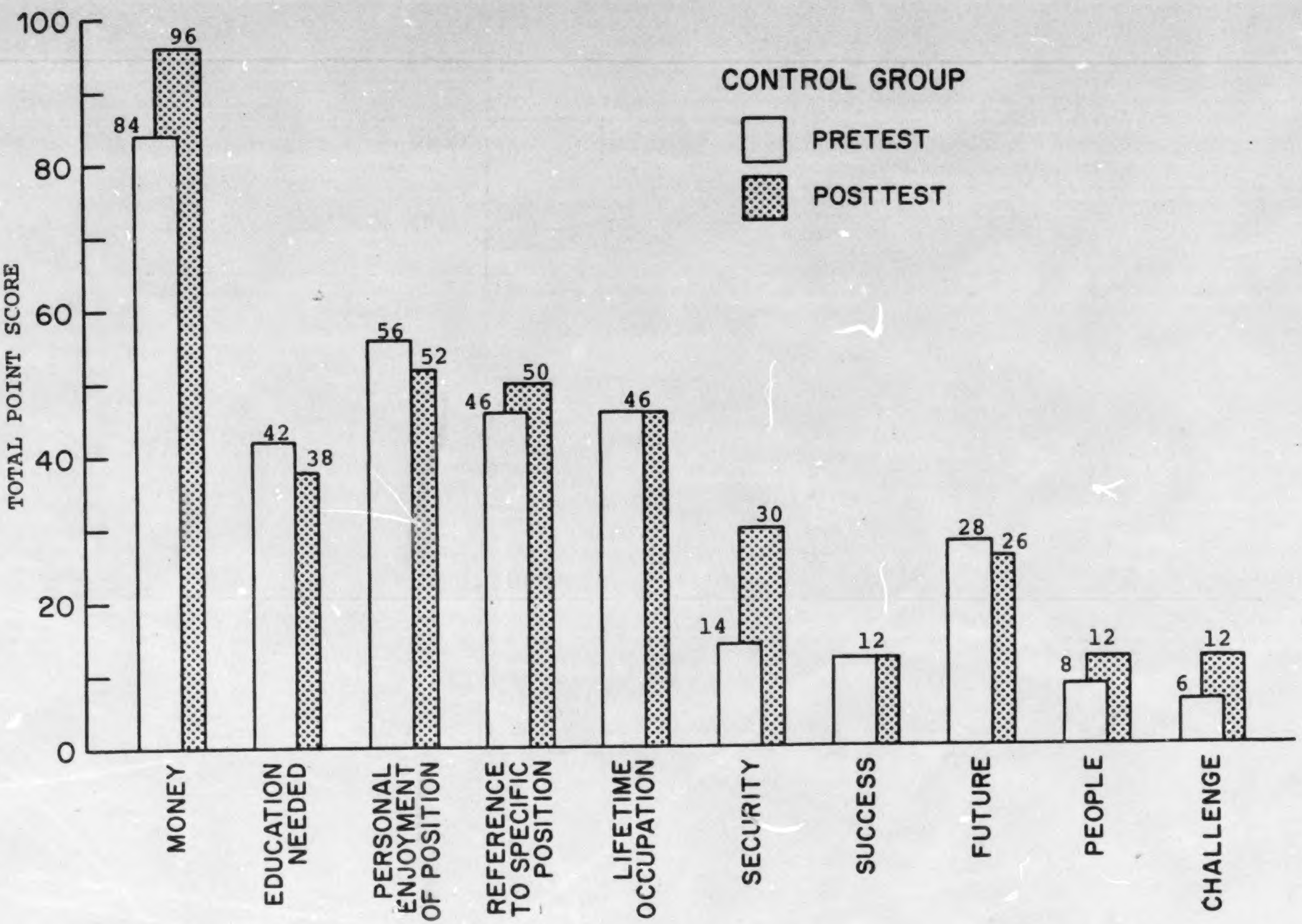
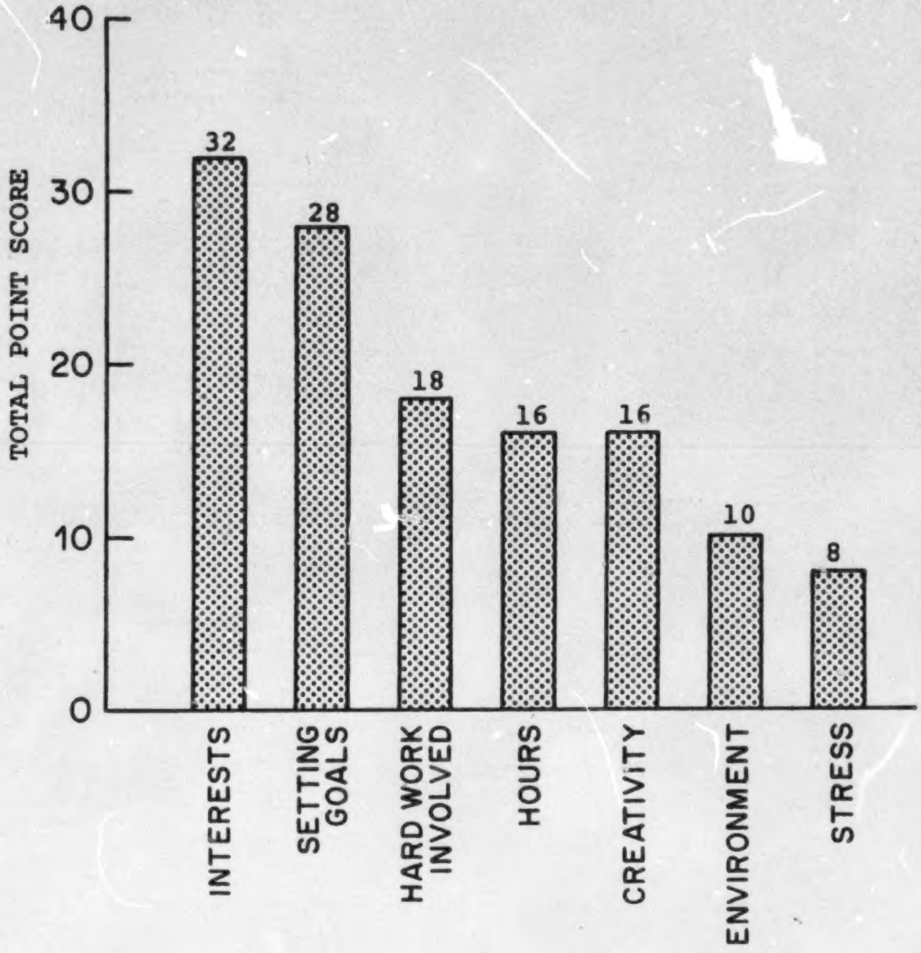


FIGURE 4b Pretest & Posttest Open-ended Statement Results - Control Group

FIGURE 4c

Posttest Responses of Treatment Group Not Reported in Open-ended Statement



on in the CHOICES workbook, worksheet and program, these additiional and varied responses suggest that something other than the main themes of money and enjoyment were of concern to the treatment group by the time of posttesting. The control group basically repeated their original pretest responses with the exception of a mention by one student of boredom, and a mention by two other students of experience as a factor where a career was concerned.

This open-ended statement lacks statistical credibility, but it does serve to reinforce the finding of the main study since the treatment group appears to have broadened its concept of a career, thus implying some maturing of their attitudes in this area.

One final area of interest is the regression scores from pre to posttest on the CMI. The male students both academic and general were least affected by this aspect of the CMI. Only one male student out of 33 students in the treatment group showed a drop in score, and that of only 2 points. The treatment group female academics suffered from this phenomenon (where 4 out of 18 scores dropped an average of 1.5 points) as did the female general students where 6 out of 14 scores dropped an average of 2.3 points.

This regression tendency was also evident in the control group, where the pattern was similar to the treatment group.

Student Evaluation of CHOICES

Although no formal request was made for a student evaluation of CHOICES, it is interesting to note that the students in the control group had requested time on CHOICES all during the period of the study. An accurate daily calendar of student appointments was kept and control students were given an opportunity to request time on the CHOICES terminal after the posttest date. Fifty-four per cent of the control group had completed their worksheet and applied for terminal time. Their reasons for doing so ranged from parent encouragement, to personal curiosity; from reaction to treatment students' praise of CHOICES to personal need of information. The students seemed to share the feeling of the students reported by Harris (1970) which range from "the computer is speedy, efficient and knows so much", "the computer knows my name", and "the computer doesn't care what occupations I look at. He's entirely objective."

> If you define counseling as bringing a group of related facts to bear upon a given situation and thus facilitating a step-by-step decision--making process, computers can perform this function with maximum speed and efficiency, with good script writing and adequate exchange between student and computer, computers can add a dimension of student involvement and excitement to self-appraisal, decision making, vocational exploration and educational exploration seldom attained in traditional counseling conferences." (Harris, 1970, p. 163)

Suggestions for Further Research

1. The program's major goal was to assess the impact of CHOICES on grade 12 students' career maturity attitudes. The developmental aspect of career maturity was not assessed in any way and a study to do this evaluation would be of interest.

2. An analysis of the effect of CHOICES on student drop-outs would be most interesting.

3. The use of career development programs (from a one day to a three-week daily program) compared to the use of CHOICES without any pre-program preparation would be of interest.

Bibliography

Austin, G.R., and Ryan, B. Computer-assisted guidance in predicting probable admission to institutions of higher education. *Journal of Educational Data Processing*, 1972, *8*, 18-23.

Aylmer, R.C. A preliminary investigation of computer involvement in vocational decision making. Unpublished doctoral dissertation, Harvard University, 1970.

Baldwin, A.L. *Theories of child development*. New York: Wylie, 1951.

Bartlett, W.S. Vocational maturity and personality variables of Manpower trainees. *Vocational Guidance Quarterly*, 1968, pp. 104-107.

Bartlett, W.S. Vocational maturity: Its past, present and future development. *Journal of Vocational Behavior*, 1971, *1*, 217-229.

Bedal, C.L., and Manuel, P.A. Career guidance in the Canadian mosaic. *Vocational Guidance Quarterly*, 1976, *24*, 344-348.

Bohn, M.J., and Super, D.E. The computer in counseling and guidance programs. *Educational Technology*, 1969, *9*, 23-31.

Bowlsbey, J.E.; Rayman, F.R.; and Bryson, D.L. Discover field trail report. Westminister, Md.: Discover Foundation, 1976.

Campbell, R.E. Career guidance practices transcending the present. *Vocational Guidance Quarterly*, 1974, *22*, 292-300.

Caplan, S.W.; Ruble, R.A.; and Segel, D. A theory of educational and vocational choice in junior high school. *Personnel and Guidance Journal*, 1963, *42* (2), 129-135.

Cassel, R.N., and Mehail, T. The Milwaukee computerized vocational guidance system (VOCGUID). *Vocational Guidance Quarterly*, 1973, *21*, 206-213.

Cassie, J.R.B. Computer-based career education systems. Unpublished paper, Ontario Institute for Studies in Education, Niagara Centre, St. Catharines, Ontario, 1976.

Cassie, J.R.B. The effects of a computer-assisted career information service on the career maturity of Ontario students in grades nine, ten and eleven. Doctoral dissertation, State University of New York at Buffalo, 1976.

Computerized vocational information system counselor's manual. Villa Park, Illinois: Willowbrook High School, CVIS Demonstration Center, 1971.

Cooley, W.W. Computer measurement system for guidance. *Harvard Educational Review*, 1964, *34*, 559-572.

Cooley, W.W. Computer systems for guidance. In *Computer-Based Vocational Guidance Systems*. Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, 1969.

Crites, J.O. Career development and career guidance, NVGA-AVA Joint Position Paper, *Journal of Employment Counseling*, 1975, *12*, 73-85.

Crites, J.O. Career maturity. NCME, *Measurement in Education*, Winter 1972-73, *4* (2).

Crites, J.O. Methodological issues in the measurement of career maturity. *Measurement and Evaluation in Guidance*, 1974, *6*, 200-209.

Crites, J.O. A career maturity inventory. In D.E. Super, ed., *Measuring vocational maturity for counseling and evaluation*. National Vocational Guidance Association Monograph, 1974, pp. 24-40.

Crites, J.O. *The Career Maturity Inventory: Theory and research*. Monterey, Cal.: CTB/McGraw Hill, 1973.

Crites, J.O. The maturity of vocational attitudes in adolescence. Washington, D.C., American Personnel and Guidance Association, Inquiry Series Monograph, No. 2, 1971.

Dowsey, M.W., and Butler, A.M. Use of a computer in careers education and guidance. *SAGSET Journal*, 1976, *6* (1), 26-29.

Drucker, P.F. *The age of discontinuity*. New York: Harper & Row, 1969.

Educational Testing Service. Interactive computer system will help students make career decisions. *Vocational Guidance Quarterly*, 1971, *20* (1), 61-62.

Ehrle, R.A. Vocational maturity, vocational evaluation and occupational information. *Vocational Guidance Quarterly*, 1970, *19*, 41-48.

Ellis, A.B., and Tiedeman, D.V. Can a machine counsel? In W. Holtzman, ed., *Computer-assisted instruction, testing, and guidance*. New York: Harper, 1970, 345-373.

English, J. A comparison of two methods of disseminating occupational information. Unpublished doctoral dissertation, University of Connecticut, 1974.

Erikson, E.H. Identity and the life cycle. *Psychological Issues*, 1959, *1* (1), 1-171.

Farmer, H. INQUIRY Project: Computer-assisted counseling center for adults. *Counseling Psychologist*, 1976, *6*, 50-54.

Flanagan, J.C. The need for improved vocational guidance. In *Computer-based vocational guidance systems*. Washington: U.S. Department of Health, Education, and Welfare, Office of Education, 1969.

Gallagher, J.J. *Computer-based vocational guidance systems*. Washington: U.S. Department of Health, Education, and Welfare, 1969.

Goodwin, W.F. S.I.G.I.: An operational example of computer-based career guidance. Paper presented at the National Computer Conference, Chicago, Illinois, 1974.

Greene, S.D. The relationship between developing a career education program and the career maturity of secondary school students. Doctoral dissertation, Kansas State University, 1973 (ARM, Vol. 7, 1003).

Gribbons, W.D., and Lohnes, P.R. Emerging Careers. New York: Columbia University, Teachers College Press, 1968.

Gross, E. A sociological approach to the analysis of preparation for work life. Personnel and Guidance Journal, 1967, 45, 416-423.

Hallworth, J.J., et al. A computer-assisted vocational counseling system. Paper presented to Canadian Council for Research in Education, March 1970.

Harris, J.A. The computerization of vocational information. Vocational Guidance Quarterly, 1968, 17, 12-20.

Harris, J.A., ed. Tested practices: Computer-assisted guidance systems. National Vocational Guidance Association Monograph, 1972. Washington, D.C.

Harris, J.A. Sex bias and computer-based guidance systems. Aries Court, Minneapolis, Minnesota, 1973.

Harris, J.A., and Tiedeman, D.V. The computer and guidance in the United States: Past, present, and a possible future. Paper prepared for the Symposium on Computer-based Counseling, 18th Congress, International Association of Applied Psychology, Montreal, P.Q., 1974.

Harris, J.E. Analysis of the effects of a computer-based vocational information system on selected aspects of vocational planning. Unpublished doctoral dissertation, Northern Illinois University, Dekalb, Illinois, 1972.

Harris - Bowlsbey, J.E. Computers in guidance: A status report. Unpublished manuscript, Western Maryland College, 1975.

Harvey, E.D., et al. An evaluation of the Student Guidance Information Service. Toronto: Ministry of Education, Ontario, 1975.

Herr, E.L. Unifying an entire system of education around career development. In K. Goldhammer and R.E. Taylor, Career education: Perspective and promise. Columbus, Ohio: Charles E. Merrill Publishing Company, 1972, 63-104.

Herr, E.L. Vocational guidance and human development. Boston: Houghton-Mifflin, 1974.

Herr, E.L., and Cramer, S.H. *Vocational guidance and career development in the schools: Toward a systems approach*. Boston: Houghton-Mifflin, 1972.

Herr, E.L., and Enderlein, T.E. Vocational maturity: The effects of school, grade, curriculum, and sex. *Journal of Vocational Behavior*, 1976, *8*, 227-238.

Holland, J.L. Career counseling: Then, now and what's next? *The Counseling Psychologist*, 1974, *4*, 24-25.

Holland, J.L. A new synthesis for an old method and a new analysis of some old phenomena. *Counseling Psychologist*, 1976, *6*, 12-15.

Hoyt, K.B. What the future holds for the meaning of work. *American Vocational Journal*, 1973, *48*, 34-37.

Impelliteri, J.T. Implementation problems: Counselor acceptance of systems. In *Computer-based vocational guidance systems*. Washington, D.C.: U.S. Office of Education, 1969. Ed. 25053.

Kapes, J.T., and Lotowytez, L.W. *Changes in occupational values of students between ninth and tenth grade as related to course of study and other student characteristics*. VDS Monograph No. 5. University Park, Penn.: Pennsylvania State University, Department of Vocational Education, 1972.

Katz, M.; Norris, L.; and Chapman, W. *S.I.G.I.: Report of a pilot study under field conditions*. Princeton: Educational Testing Service, 1973.

Katz, M.R. *Decisions and values: A rationale for secondary school guidance*. New York: College Entrance Examination Board, 1963.

Katz, M.R. Can computers make guidance decisions for students? *College Board Review*, Summer, 1969, No. 72, pp. 13-17.

Langer, J. *Theories of development*. New York: Holt, Rinehart and Winston, 1969.

Loughary, J.W. The computer is in! *Personnel and Guidance Journal*, 1970, *49*, 185-191.

Loughary, J.W.; Friesen, D.; and Hurst, R. Autocon: A computer-based automatic counseling simulation system. *Personnel and Guidance Journal*, 1966, *45*, 5-15.

Lynd, R.S., and Lynd, H.M. *Middletown in transition*, New York: Harcourt, Brace and Company, 1937.

Maola, J.F. An assessment of career information between O.W.E. students using a counselor-based versus computer-based information system. Unpublished doctoral dissertation, University of Akron, Ohio, December 1974.

McGrail, T.F. Mr. #/307. *The School Counselor*, 1967, *14*, 234-236.

Melhus, G.E. Computer-assisted vocational choice compared with traditional vocational counseling. Unpublished doctoral dissertation, Illinois Institute of Technology, Chicago, 1971.

Melhus, G.E.; Hershenson, D.B.; and Vermillion, N.E. Computer-assisted versus traditional vocational counseling with high and low readiness clients. Journal of Vocational Behaviour, 1973, 3, 137-145.

Miller, J. Information-Retrieval Systems in Guidance. Personnel and Guidance Journal, 1970, 49, 212-218.

Minor, F.J. An experimental computer-based educational and career exploration system. In D. Super, ed., Computer assisted counseling. New York: Teachers College Press, 1970.

National Vocational Guidance Assocation. Tested practices: Computer assisted guidance systems. NVGA Monograph, 1972. Washington, D.C: 1972.

Overton, E.A. How Ontario's computerized Student Guidance Information Service helps both student and counsellor. Education Canada, Winter 1975, 15 (4), 38-41.

Omvig, C.T.; Tulloch, R.W.; and Thomas, E.G. The effect of career education on career maturity. Journal of Vocational Behaviour, 1975, 7, 265-273.

Pilato, G.T. The effects of three vocational guidance treatments on some aspects of vocational preference and self-knowledge. Unpublished doctoral dissertation, Teachers' College, Columbia University, New York, 1968.

Pilato, G.T., and Meyers, R.A. Effects of computer-mediated vocational guidance procedures: Accuracy of self-knowledge. Journal of Vocational Behaviour, 1973, 3, 167-174.

Price, G.E. Computerized course exploration and selection: A computer-based system with a counselor-based system. Unpublished doctoral dissertation, Michigan State University, East Lansing, Michigan, 1971.

Ragsdale, R.G. Considering costs in educational decision making. Interchange, 1979-80, 10 (1), 41-47.

Rayman, J.R.; Bryson, D.L.; and Day, J.J. Toward a systematic computerized career development program for college students. Journal of College Student Personnel, 1978, 19 (3), 202-207.

Roberts, T.L. The uniqueness of the individual. Paper presented to the American Educational Research Association, Chicago, 1968.

Rosser, D.S. What you should know about new computer-based college selection services. Nation's Schools, 1969, 84 (5), 47-49.

Sackman, H. Man-computer problem solving: Experimental Evaluation of time-sharing and batch processing. New York: Auerbach Publishers, 1970.

Sackman, H. Time-sharing versus batch processing: The experimental evidence. AFIPS Conference Proceedings, 1968, 32, 1-10.

Smith, E.D., and Herr, E.L. Sex differences in the maturation of vocational attitudes among adolescents. Vocational Guidance Quarterly, 1972, 20, 177-182.

Super, D.E. Computer-assisted counseling. New York: Teachers College Press, 1970.

Super, D.E. Preliminary reports: Assessment of the first year of use of the Educational and Career Exploration System in secondary schools of Genessee, Michigan. Teachers College, Columbia University, New York, 1971.

Super, D.E.; Bohn, M.J., Jr.; Forrest, D.J.; Jordaan, J.P.; Lindeman, R.H.; and Thompson, A.A. A career development inventory. New York: Columbia University, Teachers College Press, 1971.

System of interactive guidance and information (S.I.G.I.). College Board Review, Summer, 1969, 13-17.

Thompson, A.S., et al. The Educational and Career Exploration System: Field trial and evaluation in Montclair High School. New York: Teachers College Press, 1970.

Tiedeman, D.V., et al. Information systems for vocational decision making. Annual Report, Harvard University, Graduate School of Education, 1967-1968.

Tiedeman, D.V., et al. Career Education and the technology of career development. Palo Alto, Cal.: American Institute for Research, 1972.

Venn, G. Man, education and work. Washington, D.C.: American Council on Education, 1964.

Westbrook, B.W., and Cunningham, J.W. The development and application of vocational maturity measures. Vocational Guidance Quarterly, 1970, 18, 171-175.

Westbrook, B.W., and Parry-Hill, J.W. The measurement of cognitive vocational maturity. Journal of Vocational Behavior, 1973, 3, 239-252.

Westbrook, B.W.; Parry-Hill, J.W.; and Woodbury, R.W. The development of a measure of vocational maturity. Educational and Psychological Measurement, 1971, 31, 541-543.

Wrenn, C.G. The dangers within. Personnel and Guidance Journal, 1970, 49, 183-184.